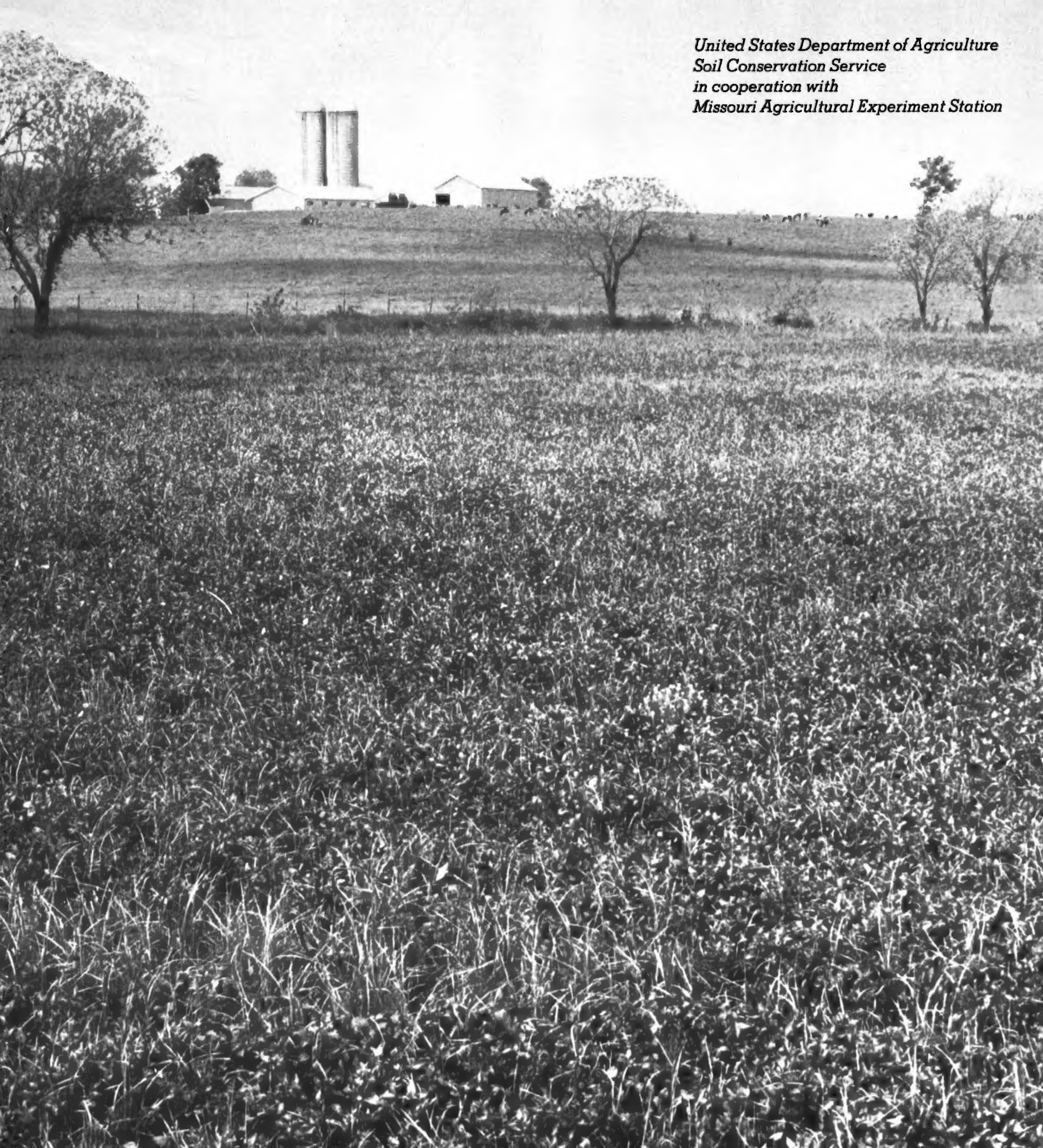
Soil Survey of

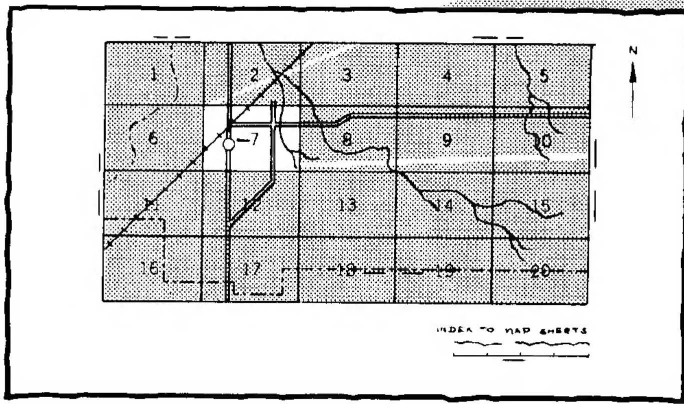
GREENE AND LAWRENCE COUNTIES, MISSOURI

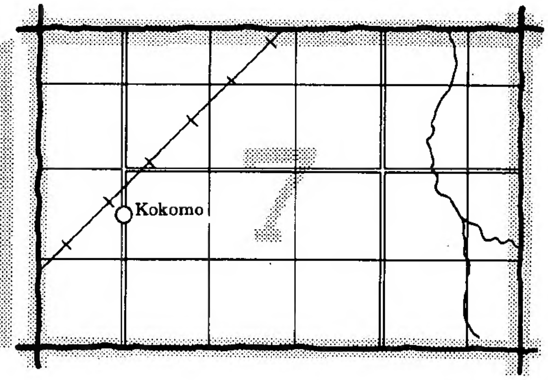
United States Department of Agriculture
Soil Conservation Service
in cooperation with
Missouri Agricultural Experiment Station



HOW TO USE

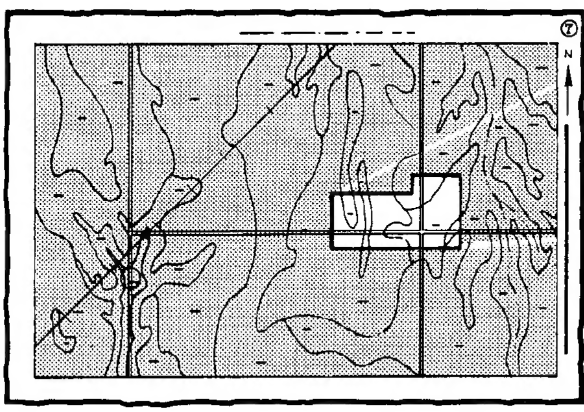
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

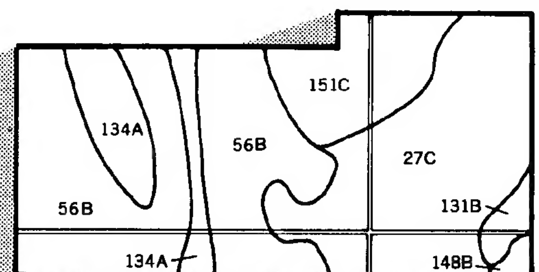




2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





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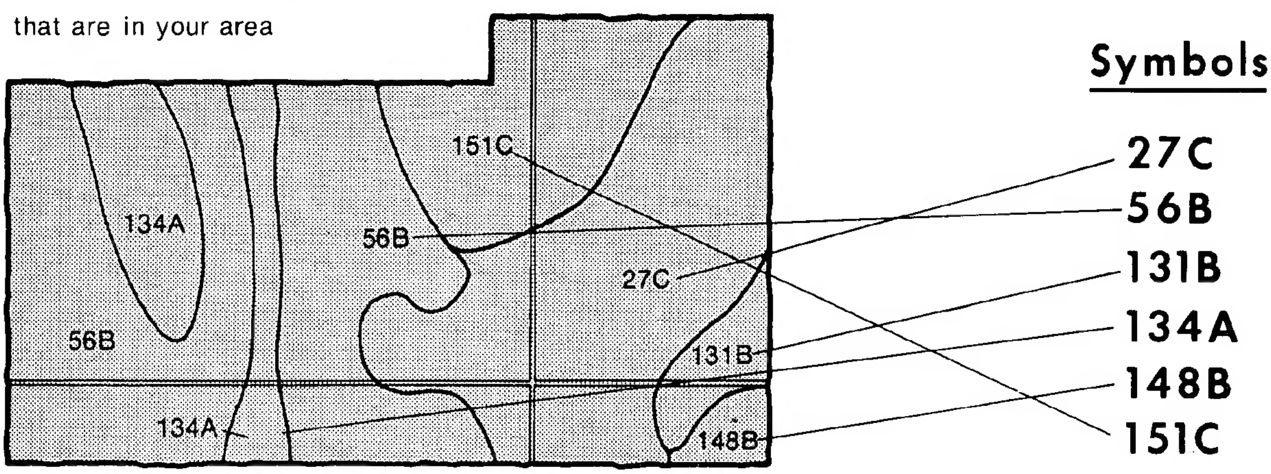
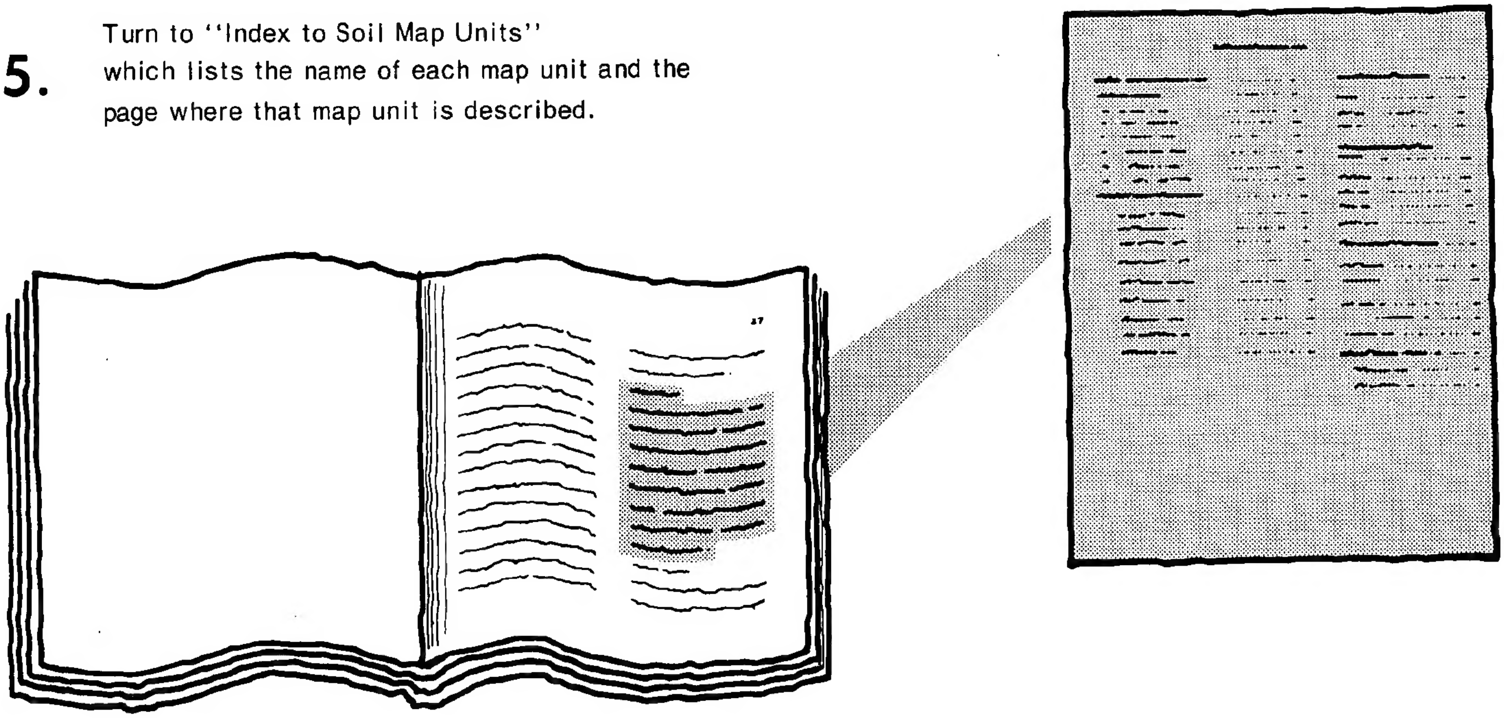
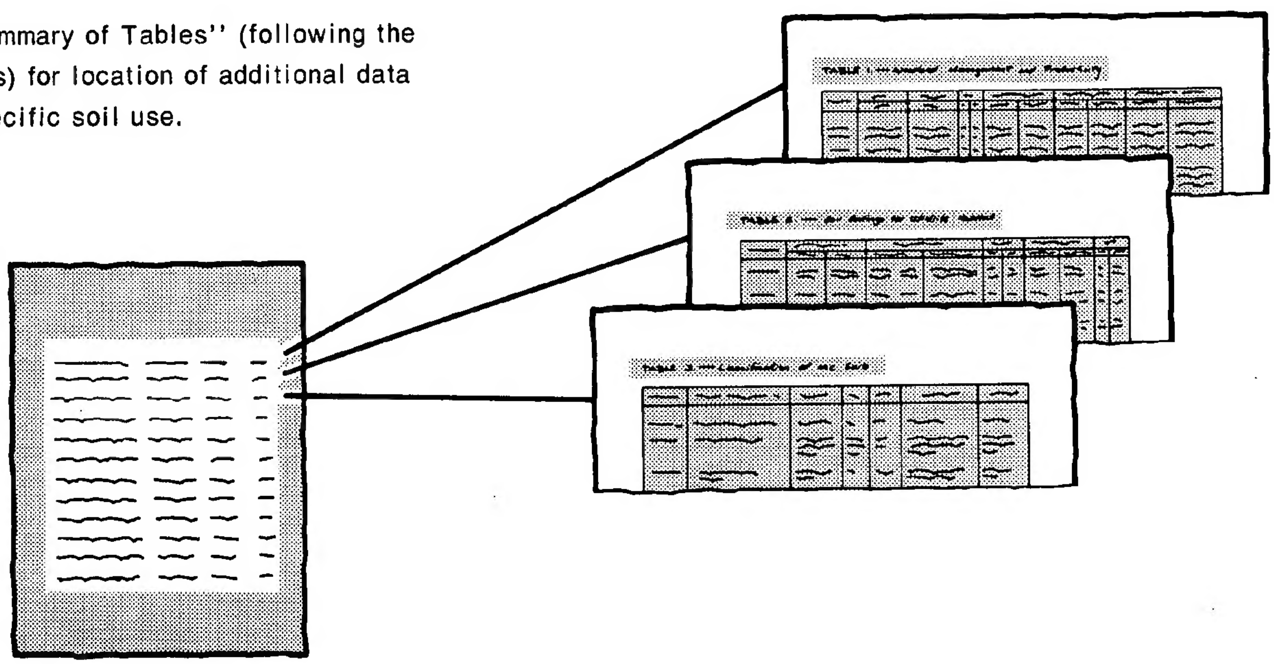


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the Missouri Agricultural Experiment Station. Contributions were made by the Greene County Soil and Water Conservation District. Funds were provided through the Greene County Soil and Water Conservation District by the City of Springfield, Missouri, and from the Department of Housing and Urban Development. The Missouri Department of Natural Resources assisted with the cost of map finishing. It is part of the technical assistance furnished to the Soil and Water Conservation Districts of Greene and Lawrence Counties. Major fieldwork was performed in the period 1970 to 1978. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Quality hay and lush pasture are typical of optimum dairy operations. Red clover and orchardgrass on Viraton silt loam, 2 to 5 percent slopes, in the foreground. Cows grazing tall fescue on Wilderness cherty silt loam, 2 to 9 percent slopes, in the background.

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Issued March 1982

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foreword

This soil survey contains information that can be used in land-planning programs in Greene and Lawrence Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extensive Service.

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soil survey of
Greene and Lawrence Counties, Missouri

By Harold E. Hughes, Soil Conservation Service

Fieldwork by Harold E. Hughes, Jerry A. Dodd, Max W. Aldrich, David W. Wolf, and John P. Francka, Soil Conservation Service, William O. Russell and Michael A. Cook, Greene County Soil and Water Conservation District

United States Department of Agriculture, Soil Conservation Service
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GREENE AND LAWRENCE COUNTIES are in the southwestern part of Missouri (fig. 1). The area of Greene County is about 677 square miles or 433,280 acres, and the area of Lawrence County is 619 square miles or 396,160 acres. The combined total area is 1,294 square miles or 829,440 acres. Springfield, in the south-central part of Greene County, is the county seat and largest city. In 1970, the population of Springfield was 120,096, and the population of Greene County was 152,929 (*22*). Centrally located Mount Vernon is the county seat of Lawrence County, but Aurora is the largest city. In 1970, the population of Mount Vernon was 2,600, that of Aurora was 5,359, and that of Lawrence County was 24,585 (*22*).

Soil surveys of Greene and Lawrence Counties were published by the U.S. Department of Agriculture in 1915 and 1928, respectively (*7, 17*). This survey updates the previous surveys, provides a detailed soil survey on aerial photography, and contains more interpretative information.

general nature of the survey area

This section gives general information about the survey area. Climate; physiography, geology, and natural resources; relief, cover, and drainage; settlement and population; and farming are discussed.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

The survey area is hot in summer, especially at low elevations, and moderately cool in winter, especially on mountains and high hills. Rainfall is fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but snow cover lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Springfield in the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 35 degrees F, and the average daily minimum temperature is 24

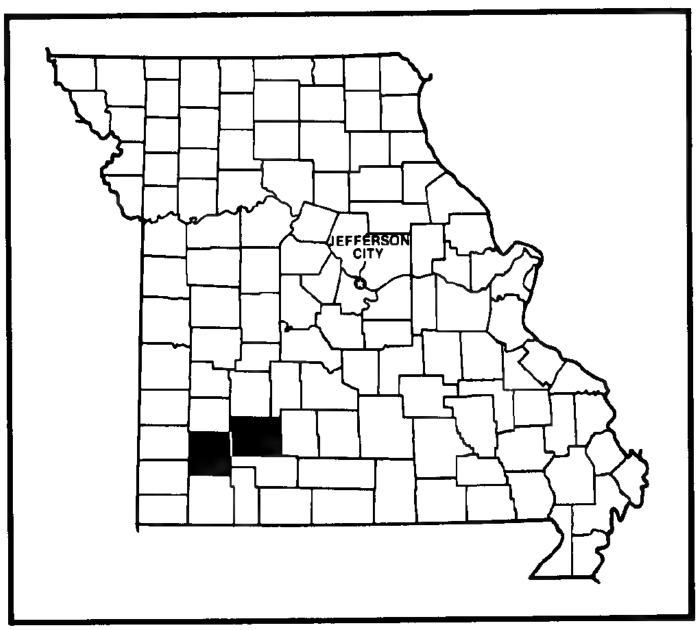

Figure 1.—Location of Greene and Lawrence Counties in Missouri.

degrees. The lowest temperature on record, which occurred at Springfield on February 2, 1951, is -11 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 113 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 41.91 inches at Mount Vernon and 39.74 inches at Springfield. Of this, 60 percent usually falls in April through September, which includes the growing season for most crops. The heaviest 1-day rainfall during the period of record was 4.82 inches at Springfield on June 9, 1975. Thunderstorms occur on about 60 days each year, and most occur in summer.

Average seasonal snowfall is 14 inches. The greatest snow depth at any one time during the period of record was 17 inches. On the average, 8 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 70 percent in summer and 50 percent in winter.

physiography, geology, and natural resources

The survey area is in parts of two physiographic provinces. Most is in the Springfield Plateau. The western edge of the Ozark Plateau, which is a minor part of the survey area, extends into the northeastern part of Greene County. The two physiographic divisions are separated by the northeast-facing Eureka Springs Escarpment (*11*). The Eureka Springs Escarpment, which averages 100 feet in height in the northeastern part of Greene County, is on Mississippian limestone overlying and underlying 60 to 75 feet of siltstone and shale. The Springfield Plateau, mainly an undulating to rolling plain, is on Mississippian rocks and on relatively small areas of Pennsylvanian rocks. The undulating to very hilly Ozark Plateau, which has a greater degree of dissection and stream entrenchment, is on Ordovician rocks.

Bedrock is present at varying depths. It consists of sedimentary rock, mostly limestone, dolomite, sandstone, and shale. Limestone, some of which is very cherty, is predominant. Faults are common.

The youngest rocks in the survey area underlie the Basehor-Bolivar association. These rocks are of Pennsylvanian age. They are part of the Cherokee Group, a coarse grained to fine grained sandstone that has some conglomerate at the base (*14*) and that is typical of the Warner Formation. The formations are comparatively thin and are exposed in less than 2 percent of the survey area.

Cambrian rocks, the oldest formations in the survey area, are not exposed. In most places, however, high yields of water can be obtained from the Eminence and Potosi Formations.

Rocks of Ordovician age overlie the Cambrian rocks. The Cotter Formation and most of the Jefferson City Formation, the oldest formations exposed in the survey area, are very similar in lithology. They both consist predominantly of cherty dolomite. The Cotter Formation includes lenses and locally persistent beds of sandstone. One sandstone, informally called "Swan Creek," is persistent in Greene County. The base of the Jefferson City Formation is not exposed, but records indicate that the combined thickness of the Cotter and Jefferson City Formations in the northeastern part of Greene County is 340 to 385 feet (*11*). Small areas of Ordovician rocks, mostly in the Cotter Formation and about 100 feet thick, are exposed west of Turnback Creek in the northeastern part of Lawrence County and in parts of Greene County. The Roubidoux Formation, consisting of sandstone, dolomitic sandstone, and cherty dolomite, underlies the Jefferson City Formation. It is an important source of water over most of the survey area. Higher yields of good water can be obtained at greater depths from Gasconade Dolomite, especially the lower very cherty part, or from the Gunter Sandstone.

Between the Pennsylvanian and Ordovician rocks are Mississippian rocks, which have greater total thickness and by far the greatest distribution in the survey area. The Mississippian rocks are predominantly cherty limestone. However, the chert content varies from minor amounts in the Burlington-Keokuk Formation to abundant amounts in the very cherty Elsey Formation. The Burlington-Keokuk and Warsaw Formations crop out extensively in many parts of the survey area. The Pierson, Compton, Northview, and Carterville Formations are also noteworthy. Shale and siltstone members dominate the Northview Formation, shale and sandstone members dominate the unconforming Carterville Formation, and sinkholes and caves are most commonly developed in the Burlington-Keokuk and Pierson Formations. Some of the best exposures of Burlington-Keokuk Limestone are along U.S. Highways 65 and 60 south of Springfield and Interstate Highway 44 on the north edge of Springfield (*12*).

Unconsolidated surficial deposits include residuum, loess, colluvium, and alluvium. Soil, a very important natural resource, is formed in these deposits. Residuum and colluvium are dominant in the survey area except for relatively small areas that have a loess cap or alluvium. The consolidated bedrock exposed in the survey area is

conspicuous, but significant in area only in some localities. Examples are the areas of shallow soils and Rock outcrop along the Sac and Little Sac Rivers in the northwestern part of Greene County.

Water for most livestock is provided by surface water from streams, lakes, and ponds. Ground water from springs sustains the flow of perennial streams. Fellows and McDaniel Lakes provide part of the water supply for Springfield. Water from Lake Springfield is used by the city for industrial purposes. A limited supply of water stored in shallow lakes or pumped from the larger streams is used for irrigation.

Deep wells provide ground water for homes, farms, towns, industries, and part of the water supply for Springfield. Adequate water of good quality for home and farm use can be obtained from the Roubidoux Formation. Wells that tap this formation should produce from 15 to 85 gallons per minute in Lawrence County and the western part of Greene County, and from 10 to 30 gallons per minute in other parts of the survey area. For larger yields one must drill to deeper aquifers, such as the Gasconade Dolomite, the Gunter member of the Gasconade Formation, or the Eminence or Potosi Dolomites (*12*).

The largest yields of water come from wells in Greene County that tap the entire Potosi Formation. Many of these wells are at a depth of 1,400 feet or more. The yield varies from 500 to 1,385 gallons per minute with an average of 700 gallons per minute (*11*).

The Missouri Geological Survey recommends that wells in the Cotter Formation in the Springfield-Bassville area of Greene County be encased. The casing should be cemented at the top and bottom to prevent polluted water, or water that could be easily polluted from the "Swan Creek" or shallower formations, from entering the well.

Burlington-Keokuk Limestone, the most important mineral resource in the survey area, crops out extensively. In the Springfield area where the demand for a large quantity of quality limestone is the greatest, this formation has a maximum thickness of 150 feet. The limestone consists of 97 to 99 percent calcium carbonate, and in many places the chert content is low enough to meet the physical specifications for Portland cement. It is used in the manufacture of lime. It is also used in asphaltic concrete, bituminous surfacing, road metal, base stone, and high quality agricultural lime.

Other limestone, as well as the dolomite formations, because of local availability, has been used for dimension stone or base stone or both.

Lead and zinc, once actively mined in the survey area, are not mined today. Important lead mines were near Aurora, Stotts City, and Springfield.

Caves are numerous in the survey area. Greene County has more known caves than any other county in Missouri. Fantastic Caverns and Crystal Cave in Greene County and Turnback and Wilson Caves in Lawrence County are the largest and best known.

relief, cover, and drainage

The survey area is in the youthful stage of the present erosion cycle. Surface features are mainly the result of a gully type of water erosion. The landscape configurations differ from one another according to geologic structure and the relative resistance of the bedrock to chemical and physical weathering. Contrasting examples of these differences are sinkholes and mounds (*11, 12*).

The tilt of the bedrock is to the southwest. The general slope of the land surface is to the west. Range in elevation is from about 910 to 1,518 feet, a total of slightly more than 600 feet. The highest point in the survey area is in Greene County, north-northwest of Strafford on a circular mound in sec. 16, T. 31 N., R. 20 W. The lowest point is the bottom of the Sac River where it leaves the northwestern part of Greene County. Elevations of 1,500 feet or slightly more are east-northeast of Monett and south-southeast of Aurora near the southern boundary of Lawrence County.

The major part of the survey area is undulating to rolling. Undulating areas are extensive on the primary divides separating the watersheds of the major streams. Uplands between the larger tributary streams are generally undulating to rolling. Some relatively large areas of nearly level upland are on top of the broad divide that separates the basins of the Osage and Neosho Rivers in the northwestern part of Lawrence County. Other noteworthy areas of nearly level or undulating lands are the flood plains and terraces of the major streams. Most of the hilly or very hilly and broken areas are adjacent to flood plains, and some of these have precipitous, rock-scarped edges.

About 13 percent of the survey area was forest in 1972 (*6*). Nearly all of this was commercial forest. Crops harvested, including hay, made up about 20 percent of the land area in 1977 (*9*). Most areas that are not in woodland or cropland have a cover of grasses and legumes and are grazed. Most of the cropland and much of the woodland are also grazed at some time during the average year.

Most deep, well drained soils on uplands in the survey area formed in thick, red, clayey, permeable residuum weathered from cherty limestone. Limestone, more soluble than sandstone, shale, or dolomite, is slowly dissolved by rainwater that quickly becomes weakly acid. A network of solution channels is developed in the bedrock. Residuum is formed from the bedrock. The bedrock surface is dissolved unevenly, leaving pinnacles 5 to 15 feet in height in many places. Caves are formed, and sinkholes develop in the land surface.

Sinkholes are closed depressions in the land surface caused by the solution and collapse of underlying beds of limestone. Many sinkholes have openings at the bottom where water drains quickly into caves and solution channels in the bedrock. The openings in many sinkholes become plugged with colluvium and other

materials, and water is ponded for a few hours. Only a very few sinkholes hold water for long periods.

Water easily moves downward and laterally through the well drained soils, permeable residuum, or the cracks and solution channels in the bedrock. Much of the rainwater becomes a part of the underground water supply. Some water emerges again at a lower level as springs and enters the surface water drainage system (*12*). In some places, small streams enter underground channels, then resurface a considerable distance downstream (7).

This two-county area lies within three major drainage basins. Flowing northward, the Sac and Pomme de Terre Rivers and their tributaries drain the northern and western parts of Greene County and the northern and northeastern parts of Lawrence County into the Osage River. Flowing southward, the James River and its tributaries drain the southern part of Greene County and the southeastern part of Lawrence County into the White River. The westward flowing Spring River and other tributaries drain the remaining and larger part of Lawrence County into the Neosho River.

settlement and population

Prior to the organization of Greene County, Osage, Sac, Kickapoo, Delaware, and Indians of other tribes hunted and fished in the area. Some settled long enough to grow corn and mine lead. Adventurers, hunters, trappers, and traders came into the area from time to time. Pioneers from Kentucky, Tennessee, and Virginia established the first permanent settlement on the James River in 1818. By 1831 other early settlements were on Spring River and Turnback Creek. Springfield was established as a trading center on the overland route from Boonville in 1830. In 1838, Springfield was incorporated. It had a population of 250 and soon became the leading city in the region.

Greene County was initially organized in 1833 from part of Crawford County. At this time, the Crawford County limits extended to the southern and western boundaries of the State. From this large area, first Barry and then Dade Counties were formed. In 1845, Lawrence County was organized from parts of Barry and Dade Counties, and in 1859 Greene County was reorganized and its present boundaries were set.

Within a decade after the organization of Greene County in 1833, the Indians had moved farther west in Missouri or to reservations in Oklahoma Territory. By this time, pioneer farmers from many parts of the State and Nation had settled in all parts of the survey area.

Farming was the principal industry and the backbone of the early settlers' economy. Isolated from the markets and a long way from rail or water transportation, the pioneer farmers lived by subsistent cropping and raising livestock. Life in the survey area was relatively easy compared to life on the open plains, but true agricultural development in the pioneer stage was slow. Consequently, the population increased slowly before the Civil War.

After the Civil War, large numbers of farmers, railroad construction workers, and businessmen came into the area. A good network of railroads was completed in the 1870's. Large areas of good openland that could easily be made ready for cultivation were available at fair prices. Crops, especially wheat and corn, as well as livestock and livestock products, could now be produced for market. General farming produced an abundance of all of these products and led the way to a prosperous economy and rapid agricultural development.

Lead and zinc were mined in the survey area. Important mines were near Aurora, Stotts City, and Springfield. This added strength to the economy, especially in the peak production years of the 1890's.

Shipping points and towns on the railroads, in farm communities, or near the mines flourished. The smooth topography and good soils in the immediate vicinity of Springfield, along with better railroad facilities, enabled it to grow faster than other towns in the region. Springfield became a collection and distribution point for raw goods from the south and west and manufactured products from the east and north, setting the pace for growth and expansion.

In recent times, transportation facilities have been improved by the addition of modern highways and by a major airport in Springfield. Ample resources of money, labor, and transportation have attracted many industries to the survey area. Large and small lakes, streams, springs, caves, and good places to hunt and fish in the area and region, coupled with the natural scenic beauty of the Ozarks, encourage tourism.

Today, Springfield is the fastest growing and third largest city in the State. It is a center for agriculture, commerce, communications, industry, and culture.

The population of Lawrence County in 1890 was about 26,000. It increased to a record high of 31,662 in 1900 and decreased to 24,585 by 1970. The estimated population of Greene County was 30,000 in 1880. The population of Greene County increased to 52,713 by 1900 and to 152,929 by 1970. Since 1910, most of the people have lived in urban parts of the survey area. Springfield has accounted for the major increase in population in Greene County throughout the years. The population of Springfield in 1900 was 23,267. In 1970 it was 120,196 and made up about 79 percent of the population of Greene County and 68 percent of the survey area. The estimated population of Springfield in 1976 was 145,000.

farming

Early settlers lived in forested areas near perennial streams where game, water, and fish were plentiful. Timber was available for the construction of shelters, fuel, and fences. Also from the forest came honey, nuts,

berries, and greens. The open range, with an abundance of tall prairie grasses and forest mast, provided food for the cattle, work animals, and hogs. Small fields on stream terraces and bottom lands were used for cultivated crops. Other fields were inclosed with rail fences (*17*), as well as corrals, to keep milk cows and mares at night and their young during the day. Corn, wheat, tobacco, cotton, flax, and hemp were cultivated, clothing was made, and meat animals slaughtered for the family needs. Within a few years the range supported large numbers of cattle, horses, mules, and hogs. Income came from the sale of surplus livestock.

From 1850 through the Civil War, most of the surplus stock was sold to buyers in the Oklahoma Territory, points west, and to the Civil War armies in the area. Also, during this period, the size and quality of the open range was reduced to a marked degree by rapid settlement, fencing, cultivation, and overgrazing. All of the stable crops, including corn and other feed grains, had to be limited to local consumption because there were no markets or means of transportation. Although most of the survey area was now settled, agriculture had developed slowly.

A good system of railroad transportation was completed in the 1870's. General farming was introduced with emphasis on the production of crops, especially corn and wheat, as well as livestock and livestock products for the market. Field crop production was concentrated on the well drained prairie uplands, river bottoms, and terraces. Corn, used mainly for livestock feed, exceeded the acreage of other crops at all times. Wheat became important, and for many years it was the principal cash crop. In about 1900, as much as one-third of the survey area was used for corn and wheat. Other grain and forage crops that provided food for livestock were oats, barley, rye, sorghums, and a wide variety of grasses and legumes. When the open range was no longer available for livestock, the acreage of crops was greatly extended.

Cattle, horses, mules, hogs, and poultry were raised in all parts of the survey area. The need for sheep decreased when home-spun wool was no longer needed. The general farmer kept beef and milk cows for added income. For a long time hogs were fattened and profitably sold. There was a demand for surplus cattle, horses, and mules. Poultry became a profitable enterprise. In later years, horses and mules have been replaced by automobiles, tractors, and trucks for work and transportation.

General farming with its great diversity of farm products was considered a desirable and secure form of agriculture. It required more intensive cultivation, better livestock husbandry, more tools, equipment, and labor, as well as better management. This led to a larger number of smaller farms, high land values, a prosperous economy, and rapid agricultural growth. General farming peaked in 1900 but retained its position of leadership for the next 40 years.

Farming of specialty crops was introduced in the 1890's. Some farmers were attracted to the production of apples, peaches, strawberries, tomatoes, and other specialty crops. The survey area became one of the important fruit growing districts in the State. Today, specialty farming is mostly restricted to a few large farms producing apples in conjunction with other types of farming. Some nursery stock is produced in the area.

Favorable natural conditions and high prices for dairy products caused many farmers to turn to commercial dairy farming, which was introduced in 1905. An abundance of good quality grasses and legumes, a long grazing season, and minimum needs for shelter helped to make the dairy industry important. Sorghum and corn silage and the increased use of alfalfa or other legume hay increased the volume and quality of dairy cattle feed, reduced feed costs, and increased profits. During World War II, the commercial dairy farm replaced the general farm as the leading type.

Since World War II, many farmers have shifted to livestock raising, primarily beef cattle, in conjunction with part-time off-the-farm employment. About 67 percent of the farmers in Greene County had off-the-farm employment for 100 days or more in 1969 (*21*). More and larger commercial beef cattle operations are being developed. The trend is toward specialization in feeder pig production and swine finishing. A few farmers are specializing in the production of eggs and broilers. Today, the beef and dairy cattle enterprises are extensive and provide the major share of the farm income in the survey area; beef and grade A milk are the leading products.

In 1977, 228,000 cattle were in the survey area. Of these, 84,000 were beef cows and 23,700 were dairy cows. In 1977 and 1978, Greene and Lawrence Counties were in the top 10 counties in the State in all categories. Lawrence County was second in beef cows and second or third in the other two categories (*9*).

The production of feed and cash-grain crops is concentrated on the best uplands, river bottoms, and terraces available and needed for these uses. The major crops are wheat, soybeans, grain sorghum, and corn. Forage crops are produced on all kinds of land from small forest glades to big river bottoms. Forage crops include grasses, legumes, small grain, and forage sorghum. All of the forage and most of the corn and grain sorghum crops are marketed through the feeding of livestock. Soybeans and wheat are sold for cash.

The land in farms made up about 80 percent of Lawrence County and 69 percent of Greene County in 1974 (*23, 24*). In 1974, 2,147 farms were in Greene County. The average farm was 138 acres. In the same year, 1,860 farms were in Lawrence County, and the average farm was 171 acres. These figures are in keeping with the trend toward a smaller number of larger farms.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil maps at the back of this publication shows broad areas called associations that have a distinctive pattern of soils, relief, and drainage. Each association on the general soil maps is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other units but in a different pattern.

The general soil maps can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Goss-Wilderness-Peridge association

Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on uplands and terraces

This association consists of narrow to relatively wide upland ridges, flood plains, and terraces (fig. 2). In places are strongly sloping to steep, stony or rocky areas and escarpments adjacent to the flood plains and stream terraces. Some areas have few to many sinkholes, especially northwest and southeast of the city of Springfield. The slope of the major soils ranges from 2 to 20 percent.

This association makes up about 45 percent of Greene County and 10 percent of Lawrence County, or about 29 percent of the survey area. The association is about 41 percent Goss soils, 14 percent Wilderness soils, 10 percent Peridge soils, 33 percent soils of minor extent, and 2 percent Rock outcrop, water areas, and miscellaneous areas.

Goss soils, on the convex sides and tops of upland ridges, are deep, well drained, and gently sloping to moderately steep. Goss soils formed in residuum weathered from cherty limestone or dolomite. Typically, the surface layer is dark grayish brown cherty silt loam about 8 inches thick. The subsoil to a depth of about 72 inches is yellowish red cherty silty clay loam in the upper part; red cherty silty clay in the middle part; and dark red, mottled, very firm cherty clay in the lower part.

Wilderness soils, on the tops and sides of upland ridges, are deep, moderately well drained, and gently sloping and moderately sloping. Wilderness soils formed in residuum weathered from cherty limestone. Typically, the surface layer is dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is brown cherty silt loam about 8 inches thick. The subsoil above the fragipan is about 11 inches thick. It is yellowish brown cherty silt loam in the upper part and brown and strong brown cherty silty clay loam in the lower part. The fragipan is about 35 inches thick. The upper part of the fragipan is pale brown cherty silt loam; and the lower part is mottled, multicolored very cherty silty clay loam. The subsoil below the fragipan is dark red cherty clay to a depth of 72 inches.

Peridge soils, on the tops and sides and in slight depressions of upland ridges and terraces, are deep, well drained, and gently sloping. Peridge soils formed in residuum weathered from cherty limestone or in thin loess or alluvium and this residuum. Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil to a depth of 72 inches is reddish brown and yellowish red silty clay loam in the upper part; red, mottled silty clay loam in the middle part; and dark red, mottled, cherty clay in the lower part.

Of minor extent in this association are the Gasconade, Cedargap, Alsup, Huntington, and Viraton soils. The gently sloping to steep, somewhat excessively drained Gasconade and moderately well drained Alsup soils are on upland ridges. The nearly level, well drained and somewhat excessively drained Cedargap and well drained Huntington soils are on flood plains. The nearly level, well drained Secesh soils and gently sloping and moderately sloping, somewhat poorly drained Freeburg soils are on stream terraces. The gently sloping, moderately well drained Viraton soils are on upland ridges and terrace ridges.

Most areas of this association are used for grasses and legumes that are fed to beef and dairy cattle. A large part of the association is second growth woodland that is harvested and sold as logs, lumber, and other wood products. A small part is used for cultivated small grain and row crops that are marketed as cash grain or fed to livestock.

Most of the soils in this association are well suited to grasses and legumes and moderately suited to trees. Also, the soils on the wider flood plains, terraces, and gently sloping uplands in which the surface layer and

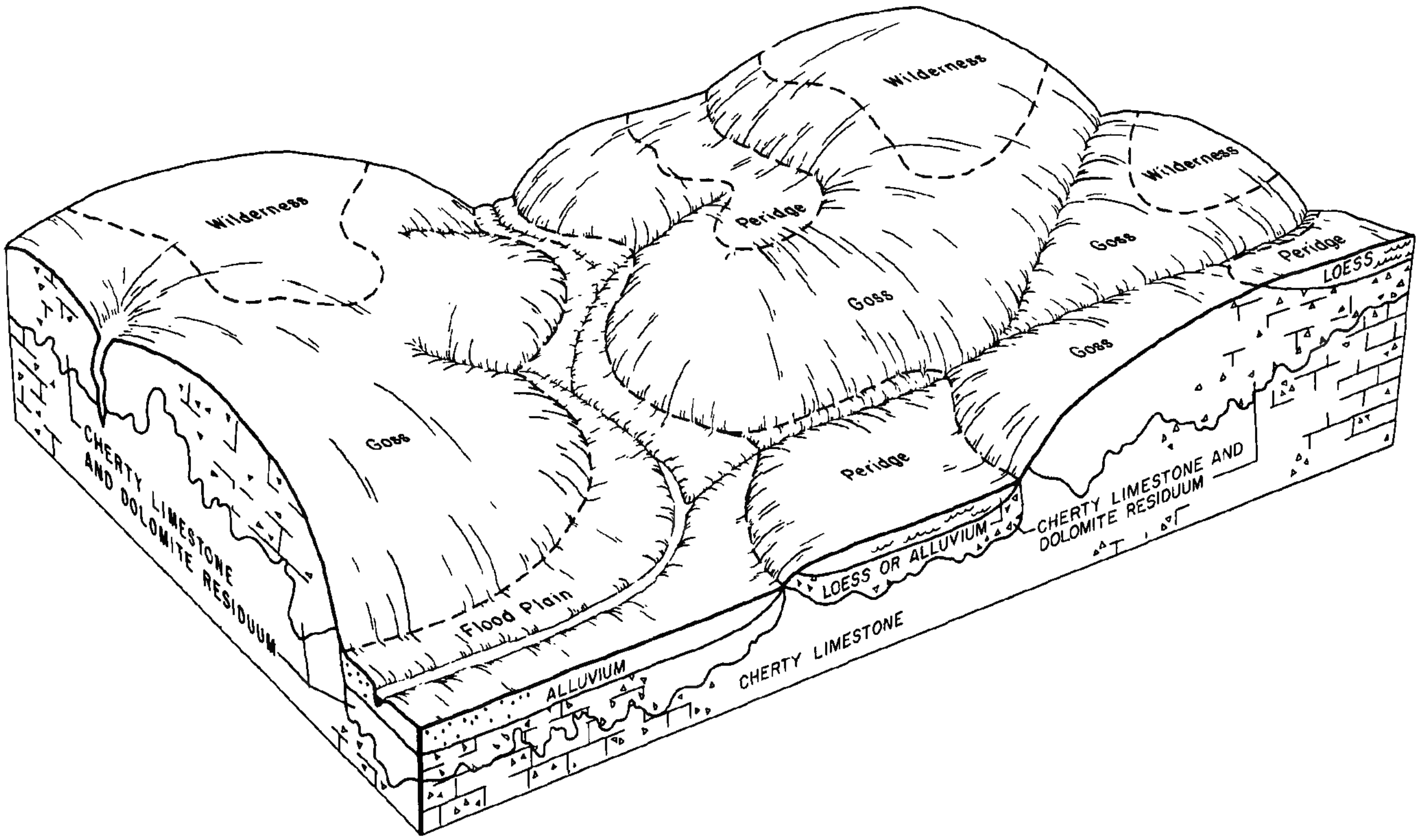

Figure 2.—Typical pattern of soils in the Goss-Wilderness-Peridge association.

upper part of the subsoil are relatively chert-free are well suited to intertilled row crops and small grain.

All of the common grain, forage, and wood crops, including such high value trees as black walnut, grow well on Peridge soils and on the Cedargap and Huntington soils of minor extent. Most of the soils on cherty uplands and some of the soils on terraces and flood plains have low available water capacity. The remaining soils have high or moderate available water capacity. The root zone of some soils is limited by the fragipan at a depth of 15 to 36 inches or by limestone bedrock at a depth of less than 20 inches. Stony or very stony areas and areas of Rock outcrop are common. The main management concerns are droughtiness, the hazard of erosion, and flooding of the bottom lands. Windthrow hazard is a concern of management in woodland areas dominated by soils that have a moderately deep or shallow root zone.

The Goss, Wilderness, and Peridge soils are suited to sanitary facilities and building site development. Major limitations are wetness and slope.

2. Pembroke-Eldon-Creldon association

Deep, well drained and moderately well drained, gently sloping to strongly sloping soils; on uplands and terraces

This association consists of broad upland ridges, narrow flood plains, and terraces (fig. 3). In places, a few gently sloping to moderately steep, stony and rocky areas and escarpments are adjacent to the flood plains and terraces. Sinkholes range from a few to many. Slope of the major soils ranges from 2 to 14 percent.

This association makes up about 23 percent of Greene County and 2 percent of Lawrence County, or about 14 percent of the survey area. Pembroke soils make up about 25 percent of this association, Eldon soils 20 percent, Creldon soils 18 percent, and soils of minor extent 37 percent.

The Pembroke soils are on the tops, sides, and in slight depressions of ridges on uplands and terraces. These soils are deep, well drained, and gently sloping. They formed in residuum weathered from cherty limestone and in thin loess or alluvium and the limestone residuum. Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil to a depth of about 72 inches is reddish brown and yellowish red silty clay loam in the upper part; red, mottled silty clay loam in the middle part; and dark red cherty clay in the lower part.

The Eldon soils are on convex sides and tops of ridges on uplands. These soils are deep, well drained,

and gently sloping to strongly sloping. They formed in residuum weathered from cherty limestone. Typically, the surface layer is dark brown cherty silt loam about 10 inches thick. The subsoil to a depth of 72 inches is reddish brown very cherty silty clay loam in the upper part; dark red very cherty silty clay in the middle part; and dusky red clay in the lower part.

The Creldon soils are on the tops and sides of ridges on uplands. These soils are deep, moderately well drained, and gently sloping. They formed in thin loess and residuum weathered from cherty limestone. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil above the fragipan is about 15 inches thick. The upper part is dark brown, mottled silty clay loam, and the lower part is grayish brown and dark grayish brown, mottled silty clay loam. The fragipan is mottled red, grayish brown, and dark gray silty clay loam and cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a depth of 67 inches is dark red cherty silty clay and yellowish brown and dark red cherty clay.

Of minor extent in this association are Keeno, Cedargap, Newtonia, Lanton, Hepler, and Gerald soils. The gently sloping and moderately sloping, moderately well drained Keeno soils; very gently sloping, well drained Newtonia soils; and nearly level, somewhat poorly drained Gerald soils are on ridges on uplands. The nearly level, well drained and somewhat excessively drained Cedargap soils and somewhat poorly drained Lanton soils are on flood plains. The nearly level, somewhat poorly drained Hepler soils are on low terraces.

About 85 percent of the areas in this association is used for grasses and legumes. Most of the remaining areas are used for cultivated small grain and row crops, and 5 percent is in second growth woodland. The forage crops and most of the grain crops are fed to beef and dairy cattle. Wheat and soybeans are sold as cash grain.

Except for a few stony areas and small scattered areas of Rock outcrop, the soils in this association are well suited to grasses, legumes, and small grain. The gently sloping soils on uplands that are relatively chert-free in the surface layer and upper part of the subsoil and soils on the wider flood plains and terraces are well suited to cultivated crops.

All of the common forage and grain crops grow well on Creldon and Pembroke soils and on the Newtonia, Gerald, and Lanton soils of minor extent. Most of these

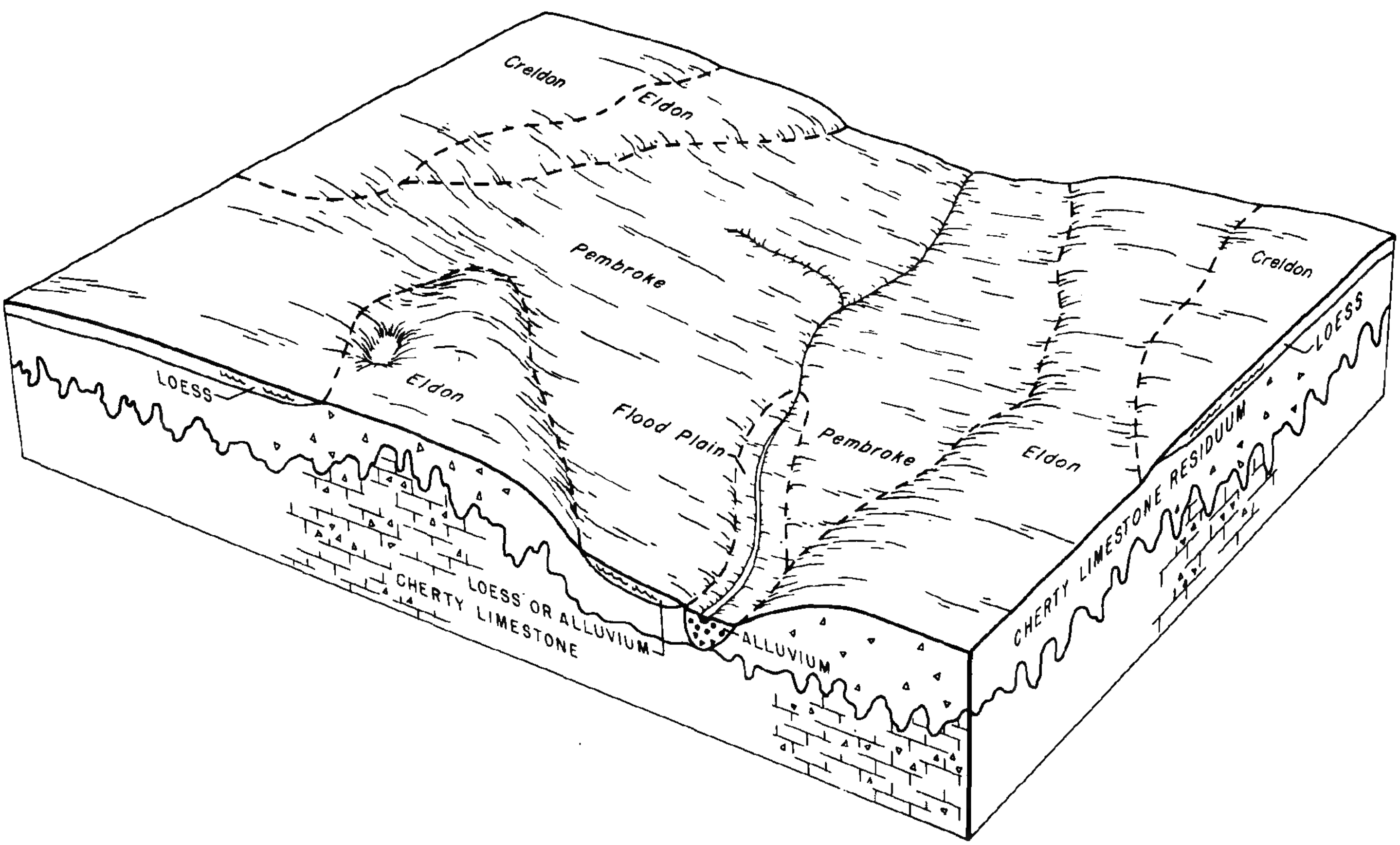

Figure 3.—Typical pattern of soils in the Pembroke-Eldon-Creldon association.

soils have high or moderate available water capacity. The remaining soils, most on cherty uplands and some on narrow flood plains, have low available water capacity. More than one-third of the soils have a dense fragipan at a depth of 18 to 36 inches that limits the root zone and causes a perched high water table in winter and spring. The main management concerns are droughtiness and controlling erosion, especially in cropland on soils that have slope of more than 2 percent.

The major soils in this unit are suited to sanitary facilities and building site development. The major concerns are wetness or moderate shrink-swell potential in the clayey subsoil. Also, pollution of ground water by waste disposal facilities is possible, and serious pollution occurs in places in the limestone sinkhole areas. Examples are along Wilson Creek and near Republic in Greene County (*25*).

3. Wilderness-Viraton association

Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands and terraces

This association consists of broad upland ridges, narrow flood plains, and terraces (fig. 4). In places, sinkholes range from few to many. Slope of the major soils ranges from 2 to 9 percent.

This association makes up about 25 percent of Greene County and 34 percent of Lawrence County, or about 29 percent of the survey area. Wilderness soils make up about 40 percent of this association, Viraton soils 30 percent, and soils of minor extent about 30 percent.

The Wilderness soils are on the sides and tops of ridges on uplands. These soils are deep, moderately well drained, and gently sloping and moderately sloping. They formed in residuum weathered from cherty limestone. Typically, the surface layer is dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is brown cherty silt loam about 8 inches thick. The subsoil above the fragipan is about 11 inches thick. The upper part is yellowish brown cherty silt loam, and the lower part is brown and strong brown cherty silty clay loam. The fragipan is about 35 inches thick. The upper part is pale brown cherty silt loam, and the lower part is mottled, multicolored very cherty silty clay loam. The

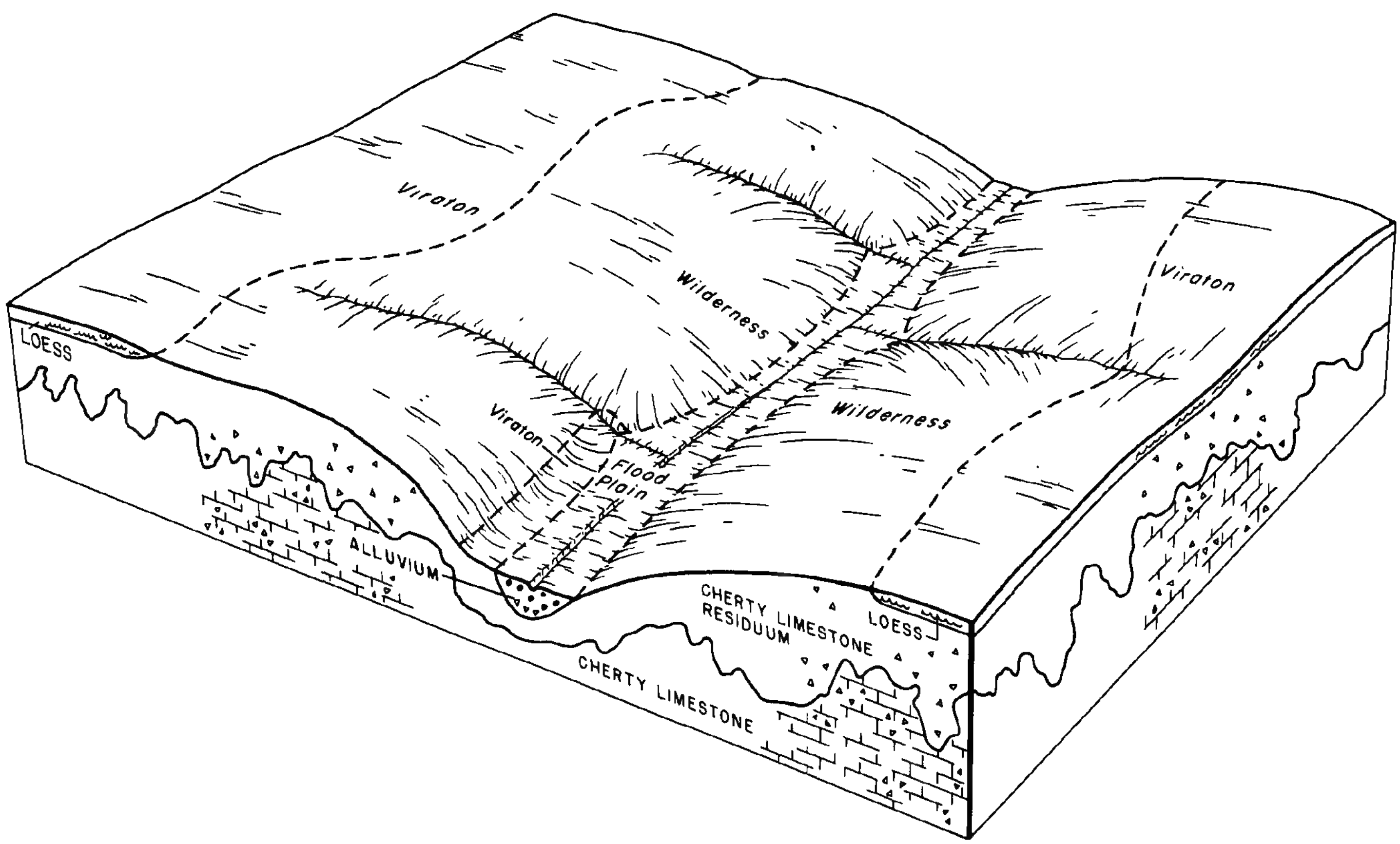

Figure 4.—Typical pattern of soils in the Wilderness-Viraton association.

subsoil below the fragipan to a depth of 72 inches is dark red cherty clay.

The Viraton soils are on the tops, sides, and foot slopes of ridges on uplands and terraces. These soils are deep, moderately well drained, and gently sloping. They formed in thin loess and residuum weathered from cherty limestone. Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil above the fragipan is about 15 inches thick. The upper part is yellowish brown and strong brown silty clay loam, and the lower part is strong brown, mottled silty clay loam. The fragipan is reddish brown and yellowish red, mottled very cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red, mottled cherty clay.

Of minor extent in this association are Needleye, Cedargap, Goss, Peridge, and Clarksville soils. The very gently sloping, moderately well drained Needleye soils; nearly level to strongly sloping, well drained Goss soils; and moderately sloping to steep Clarksville soils are on uplands. The nearly level, well drained and somewhat excessively drained Cedargap soils are on flood plains. The gently sloping, well drained Peridge soils are on upland and terrace ridges.

About 80 percent of the areas in this association is used for grasses and legumes. Most remaining areas are in second growth woodland or are used for cultivated crops. The forage and most of the grain is fed to beef and dairy cattle. Wheat, soybeans, some grain sorghum, and corn are marketed as cash grain. Some logs, lumber, and wood products are marketed.

Nearly all of the areas in this association are well suited to grasses and legumes, and about half of the areas are well suited to small grain.

Most of the common grasses and legumes grow well on nearly all of the soils in this association. Small grain grows well on the gently sloping upland soils that are relatively chert-free in the surface layer and upper part of the subsoil. Small grain, row crops, and trees grow well on most soils on the terraces and flood plains. The major soils have low or moderate available water capacity. They have a dense fragipan at a depth of 15 to 36 inches that limits the root zone, and in most years, they have a perched high water table from December to March. The main management concerns are droughtiness, the windthrow hazard in woodlands, and controlling erosion, especially in cropland on soils that have slope of more than 2 percent.

The major soils in this unit are suited to sewage lagoons and building site development. They are poorly suited to septic tank absorption fields. The major concern is wetness.

4. Basehor-Bolivar association

Shallow and moderately deep, well drained, gently sloping to strongly sloping soils; on uplands

This association consists of somewhat broken, nonstony and stony upland ridges and a few, narrow, nearly level flood plains and terraces (fig. 5). In places, rock escarpments are at the upland edge of the flood plains. Slope of the major soils ranges from 2 to 14 percent.

This association makes up about 1 percent of Greene County and 3 percent of Lawrence County, or about 2 percent of the survey area. Basehor soils make up about 40 percent of this association, Bolivar soils 36 percent, and soils of minor extent 24 percent.

The Basehor soils are on the sides, tops, and terminal points of ridges on uplands. These soils are shallow, well drained, and gently sloping to strongly sloping. They formed in residuum weathered from acid, fine grained sandstone and siltstone. Typically, the surface layer is dark brown and brown stony fine sandy loam about 3 inches thick. The subsoil is brown and strong brown fine sandy loam about 10 inches thick. Yellowish brown hard sandstone that is fractured at intervals of 1 to 3 feet is at a depth of about 13 inches.

The Bolivar soils are on convex tops, sides, and foot slopes of ridges on uplands. These soils are moderately deep, well drained, and gently sloping. They formed in residuum weathered from acid sandstone with thin beds of clayey and sandy shale. Typically, the surface soil is brown fine sandy loam about 11 inches thick. The subsoil is about 21 inches thick. The upper part is strong brown loam; the middle part strong brown and reddish brown, mottled clay loam; and the lower part is mottled, multicolored sandy clay loam. The substratum to a depth of 60 inches is yellowish red and brownish yellow soft sandstone and thin lenses of shale.

Of minor extent in this association are Barco, Collinsville, Cedargap, Lanton, and Secesh soils. The gently sloping to strongly sloping, well drained to somewhat excessively drained Collinsville soils are on uplands. The nearly level, well drained and somewhat excessively drained Cedargap soils and somewhat poorly drained Lanton soils are on flood plains. The nearly level, well drained Secesh soils are on stream terraces.

About 55 percent of the areas in this association is in poor quality, second growth oak woodland. Most of the remaining areas are used for grasses and legumes. A very small acreage is used for cultivated small grain and row crops. The forage and grain produced are fed to beef cattle and other livestock. Some logs, lumber, and wood products are marketed.

Most soils in this association are well suited to grasses and legumes and have poor or fair suitability for trees. More than half of the acreage is well suited to small grain and has fair suitability for cultivated crops.

Most common grasses, legumes, and small grain grow well on soils on terraces and flood plains and on more than half of the uplands. Fair growth of common grasses and legumes can be expected on the remaining large areas of upland. The major soils in this association are

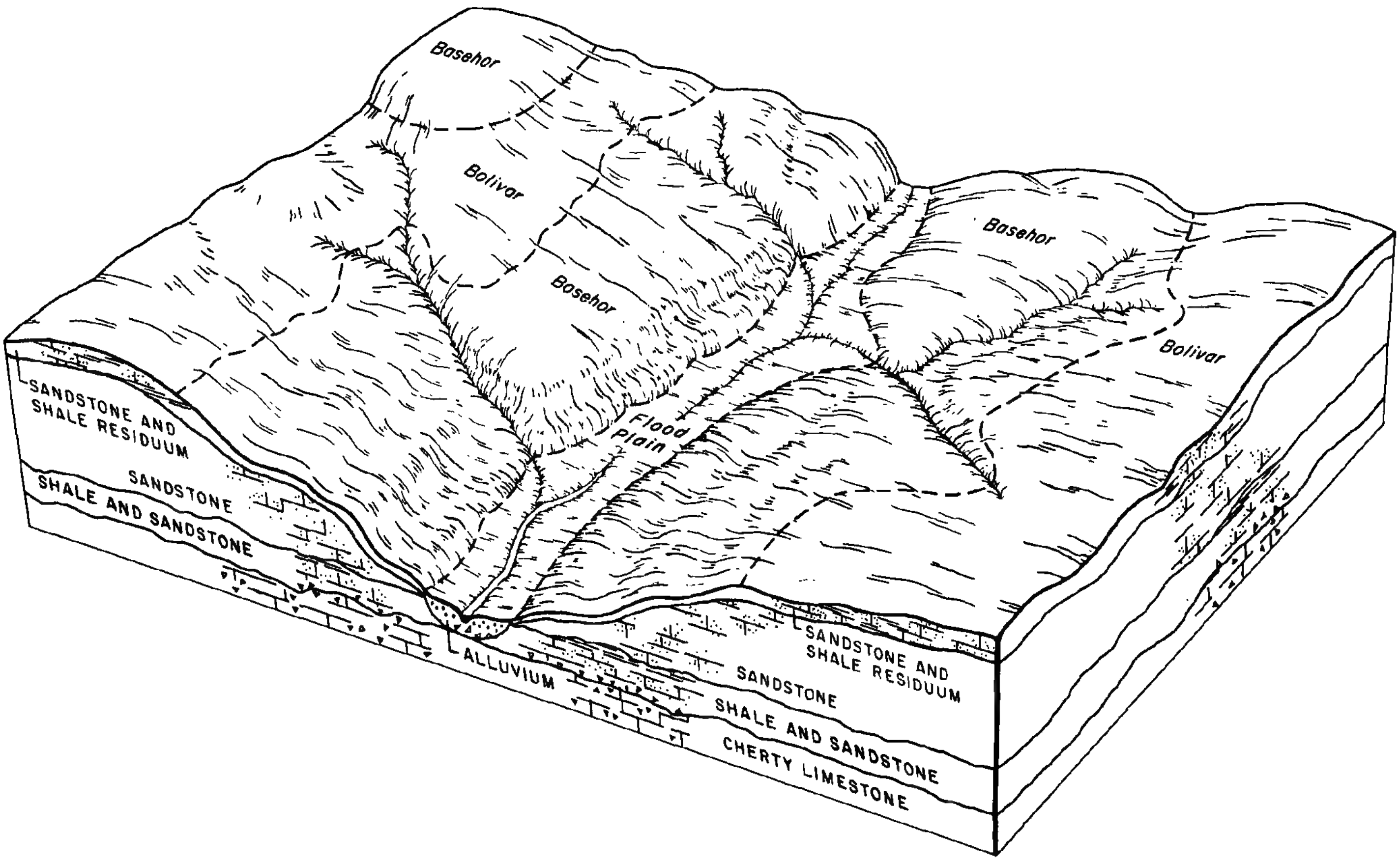

Figure 5.—Typical pattern of soils in the Basehor-Bolivar association.

moderately deep or shallow to sandstone and have low or very low available water capacity. Stony areas and scattered areas of Rock outcrop are common. The major management concerns are droughtiness and control of erosion, especially in cropland on soils that have a slope of more than 2 percent.

The Bolivar soils in this unit are suited to sanitary facilities and building site development. The major concerns are moderate depth to bedrock, extensive areas that have stones on the surface, and slope of 5 to 14 percent.

5. Hoberg-Keeno-Creldon association

Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands and terraces

This association is only in Lawrence County. It consists of broad upland ridges, narrow flood plains, and terraces (fig. 6). In places, sinkholes range from few to many. Slope of the major soils ranges from 2 to 9 percent.

This association makes up about 29 percent of Lawrence County, or about 13 percent of the survey area. Hoberg soils make up about 34 percent of this association, Keeno soils 25 percent, Creldon soils 17 percent, and soils of minor extent 24 percent.

The Hoberg soils are on the tops, sides, and foot slopes of ridges on uplands and terraces. These soils are deep, moderately well drained, and gently sloping. They formed in thin loess and residuum weathered from cherty limestone. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil above the fragipan is dark brown and reddish brown silty clay loam about 15 inches thick. The fragipan is mottled reddish brown, light brown, and pinkish gray very cherty silty clay loam about 25 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red and dark reddish brown, mottled very cherty clay.

The Keeno soils are on the sides and tops of ridges on uplands. These soils are deep, moderately well drained, and gently sloping and moderately sloping. They formed in residuum weathered from cherty limestone. Typically, the surface soil is dark brown cherty silt loam about 17 inches thick. The subsoil above the fragipan is dark brown, mottled very cherty silt loam and very cherty silty clay loam about 13 inches thick. The fragipan is

pale brown and reddish brown, mottled very cherty silt loam about 15 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red very cherty clay.

The Creldon soils are on the tops and sides of ridges on uplands. These soils are deep, moderately well drained, and gently sloping. They formed in thin loess and residuum weathered from cherty limestone. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil above the fragipan is about 15 inches thick. The upper part is dark brown, mottled silty clay loam, and the lower part is grayish brown and dark grayish brown, mottled silty clay loam. The fragipan is mottled red, grayish brown, and dark gray silty clay loam and cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a depth of 67 inches is dark red cherty silty clay and yellowish brown and dark red cherty clay.

Of minor extent in this association are Cedargap, Gerald, Pembroke, Eldon, Secesh, Newtonia, and Peridge soils. The nearly level, somewhat poorly drained Gerald soils; gently sloping to strongly sloping, well drained Eldon soils; and very gently sloping, well drained Newtonia soils are on uplands. The nearly level, well drained and somewhat excessively drained Cedargap soils are on flood plains. The nearly level, well drained Secesh soils are on stream terraces. The gently sloping, well drained Pembroke and Peridge soils are on ridges on uplands and terraces.

About 70 percent of the areas in this association is used for grasses and legumes. Most remaining areas are used for cultivated small grain and row crops. Small isolated areas are in woodland. The forage and most of the grain are fed to beef and dairy cattle and other livestock. Wheat, soybeans, some corn, and grain sorghum are sold as cash grain.

Soils in this association are well suited to grasses, legumes, and small grain. About 25 percent of the areas has good suitability for cultivated crops.

Most of the common grasses, legumes, and small grain grow well on the soils of this association. All of the common row crops also grow well on some soils. The major soils have low or moderate available water capacity, a dense fragipan at a depth of 16 to 36 inches that limits the root zone, and a perched high water table during winter and spring. The main management concerns are droughtiness and controlling erosion, especially in cropland on soils that have slope of more than 2 percent.

The major soils in this unit are suited to sanitary facilities and building site development. The major concern is wetness.

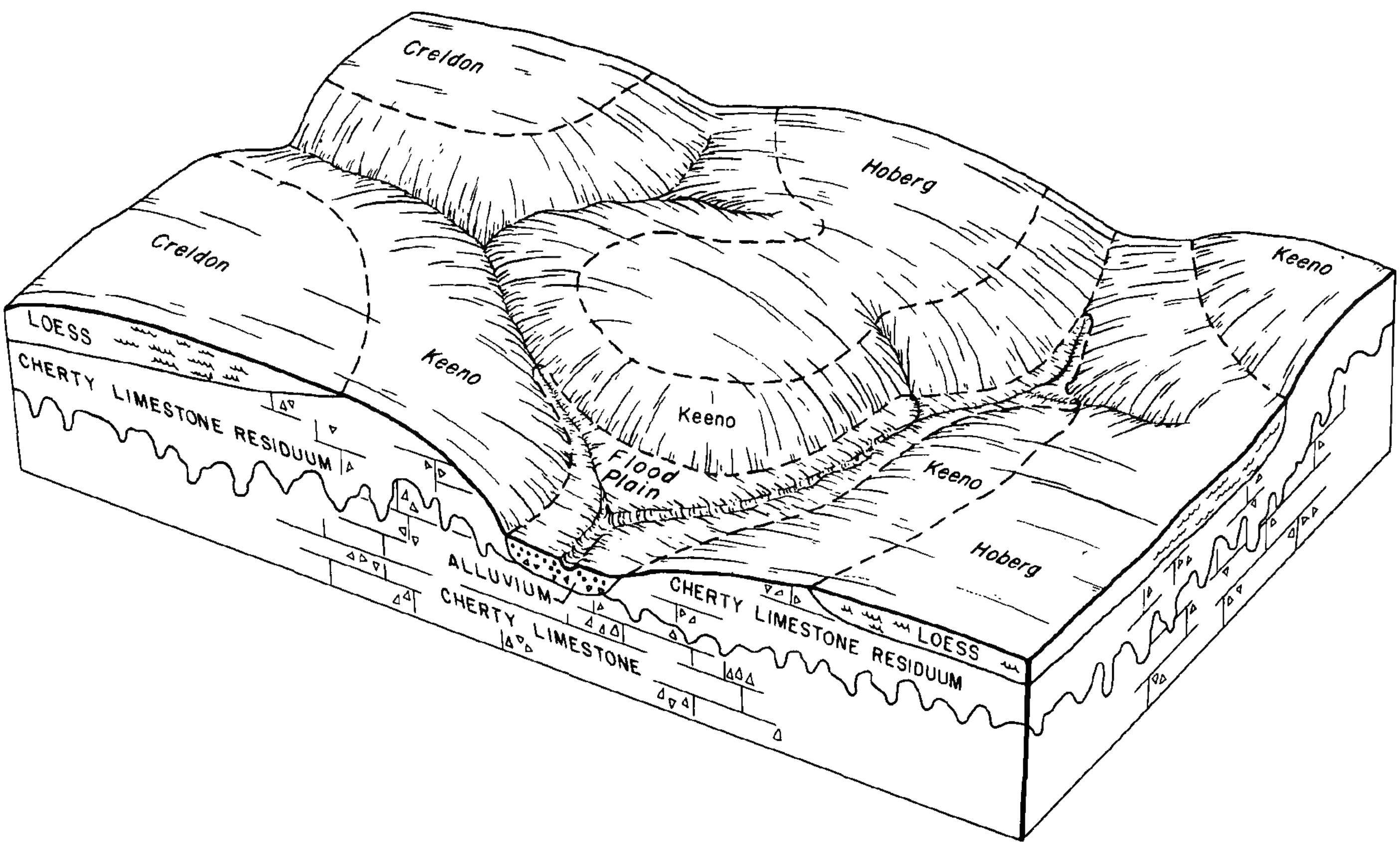

Figure 6.—Typical pattern of soils in the Hoberg-Keeno-Creldon association.

6. Clarksville-Nixa association

Deep, somewhat excessively drained and moderately well drained, gently sloping to steep soils; on uplands

This association consists of upland ridges and narrow flood plains (fig. 7). In places, rock escarpments are at the upland edge of flood plains and terraces of larger streams. Slope of the major soils ranges from 2 to 30 percent.

This association makes up about 1 percent of Greene County and 12 percent of Lawrence County, or about 6 percent of the survey area. Clarksville soils make up about 53 percent of this association, Nixa soils 36 percent, and soils of minor extent 11 percent.

The Clarksville soils are on the sides, tops, and terminal points of ridges on uplands. These soils are deep, somewhat excessively drained, and moderately sloping to steep. They formed in loamy and clayey residuum or colluvial-alluvial materials weathered from cherty limestone. Typically, the surface layer is very dark grayish brown cherty silt loam about 4 inches thick. The subsurface layer is yellowish brown cherty silt loam about 5 inches thick. The subsoil to a depth of about 72 inches is brown very cherty silt loam in the upper part; strong brown, mottled very cherty silty clay loam in the middle part; and dark red, mottled very cherty clay in the lower part.

The Nixa soils are on the tops and sides of ridges on uplands. These soils are deep, moderately well drained, and gently sloping and moderately sloping. They formed in loamy residuum weathered from cherty limestone. Typically, the surface soil is very dark grayish brown over grayish brown cherty silt loam about 6 inches thick. The subsoil above the fragipan is yellowish brown very cherty silt loam about 12 inches thick. The fragipan is about 23 inches thick. The upper part is strong brown, mottled

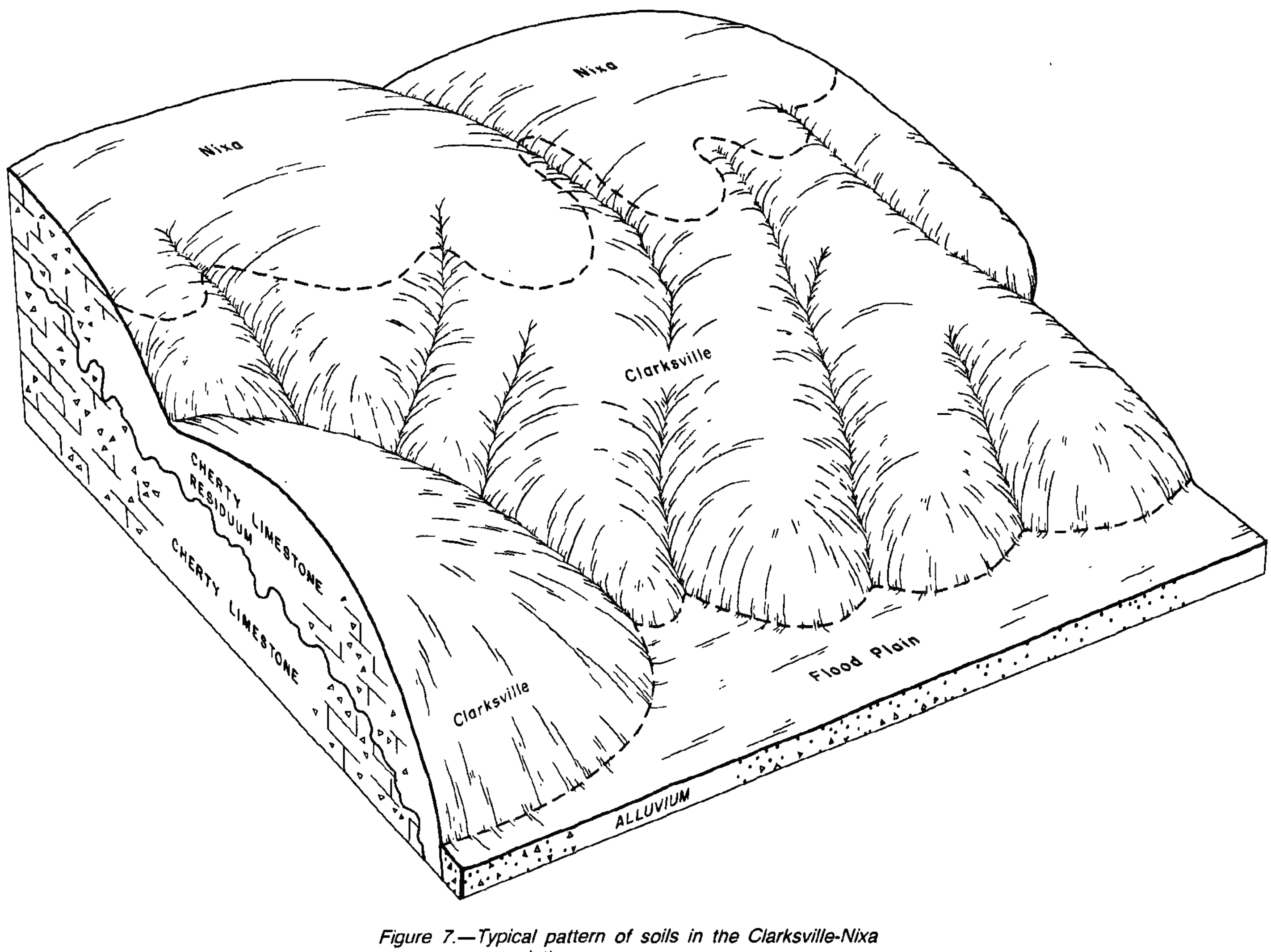

Figure 7.—Typical pattern of soils in the Clarksville-Nixa association.

very cherty silt loam, and the lower part is mottled, multicolored very cherty silty clay loam. The subsoil below the fragipan to a depth of 72 inches is dark reddish brown and dark red cherty clay.

Of minor extent in this association are Cedargap, Secesh, Waben, Viraton, and Huntington soils. The well drained, nearly level Secesh soils and nearly level and gently sloping Waben soils are on stream terraces. The nearly level, well drained Huntington soils and somewhat excessively drained and well drained Cedargap soils are on flood plains. The gently sloping, moderately well drained Viraton soils are on ridges on uplands and terraces.

Nearly all areas of this association are used for grasses, legumes, and trees. The pastureland and woodland acreage is about the same. A very small acreage is used for cultivated small grain and row crops. The forage and grain produced are fed to beef and dairy cattle. Most mature trees are harvested and sold as logs, lumber, and other wood products.

Most of the soils in this assocation are well suited to grasses and legumes. The suitability for trees is fair or good. Most common grasses and legumes grow well on the soils in this association. Cultivated crops and trees grow well on the soils on terraces and flood plains. Trees also grow well on the strongly sloping to steep soils on north- and east-facing upland slopes. Both major soils and some of the minor soils have low available water capacity. More than one-third of the soils have a dense fragipan at a depth of 14 to 24 inches that limits the root zone. The main management concerns are droughtiness, controlling the grazing of pastureland, and the windthrow hazard in woodland.

The major soils in this unit are suited to sanitary facilities and building site development. The main concerns are wetness and slope.

7. Huntington association

Deep, well drained, nearly level soils; on flood plains

This association consists of wide flood plains and terraces (fig. 8).

This association makes up about 1 percent of Greene County and 4 percent of Lawrence County, or about 2 percent of the survey area. Huntington soils make up about 68 percent of this association, soils of minor extent 28 percent, and water areas 4 percent.

The Huntington soils are on flood plains. These soils are deep, well drained, and are occasionally flooded. Typically, the surface soil is very dark grayish brown silt loam about 12 inches thick. The subsoil is brown silt loam about 36 inches thick. The substratum to a depth of 60 inches is brown and dark brown, mottled silt loam.

Of minor extent in this association are Hepler, Lanton, Cedargap, Osage, Peridge, Secesh, and Waben soils. The nearly level, somewhat poorly drained and poorly drained Lanton soils, well drained and somewhat excessively drained Cedargap soils, and poorly drained Osage soils are on flood plains. The nearly level, somewhat poorly drained Hepler soils are on low terraces. The well drained, gently sloping Peridge soils; nearly level Secesh soils; and nearly level and gently sloping Waben soils are on ridges on terraces.

About 60 percent of the areas in this association is used for cultivated crops. Most of the remaining areas are used for grasses and legumes. Most of the woodland is in limited access areas and on streambanks. Wheat, soybeans, some corn, and grain sorghums are marketed as cash grain. The forage and most of the grain produced are fed to beef and dairy cattle and other livestock. Mature trees are harvested and sold as logs, lumber, or other wood products.

The soils in this association are well suited to cultivated crops. Under good management, row crops can be grown year after year. The suitability is good for irrigated crops, especially alfalfa and other high-value crops, but the availability of an adequate water supply limits the acreage that can be irrigated.

Corn, sorghums, soybeans, small grain, grasses, legumes, and trees grow well on the soils in this association. About 90 percent of the soil has very high or high available water capacity. The main management concerns are common flooding and the improvement of surface drainage.

Most soils in this association are generally not suited to sanitary facilities and building site development. The major concern is flooding.

8. Creldon-Parsons association

Deep, moderately well drained and somewhat poorly drained, gently sloping and nearly level soils; on uplands

This association is only in Lawrence County. It consists of broad upland ridges and a few narrow flood plains and terraces (fig. 9). Slope of the major soils ranges from 0 to 4 percent.

This association makes up about 6 percent of Lawrence County, or about 3 percent of the survey area. Creldon soils make up about 43 percent of this association, Parsons soils 36 percent, and soils of minor extent 21 percent.

The Creldon soils are on the sides and tops of ridges on uplands. These soils are deep, moderately well drained, and gently sloping. They formed in thin loess and residuum weathered from cherty limestone. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil above the fragipan is about 15 inches thick. The upper part is dark brown, mottled silty clay loam, and the lower part is grayish brown and dark grayish brown, mottled silty clay loam. The fragipan is mottled red, grayish brown, and dark gray silty clay loam and cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a

depth of 67 inches is dark red cherty silty clay and yellowish brown and dark red cherty clay.

The Parsons soils are on the tops and sides of broad ridges on uplands. These soils are deep, somewhat poorly drained, and nearly level. They formed in thin loess and residuum weathered from shale and cherty limestone. Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part is very dark grayish brown, mottled clay, and the lower part is multicolored, very firm clay. The substratum to a depth of 66 inches is light brownish gray, mottled silty clay loam.

Of minor extent in this association are Carytown, Keeno, Hoberg, Lanton, Cedargap, and Hepler soils. The nearly level, poorly drained, sodium-rich Carytown soils and gently sloping, moderately well drained Hoberg soils are on ridges on uplands and terraces. The gently sloping and moderately sloping, moderately well drained Keeno soils are on uplands. The nearly level, somewhat poorly drained and poorly drained Lanton soils and well drained and somewhat excessively drained Cedargap soils are on flood plains. The nearly level, somewhat poorly drained Hepler soils are on low terraces.

The farms in this association are few, large, and are worked with big machinery. About 70 percent of the areas is used for cultivated small grain and row crops. Much of the wheat is harvested in June and July; the land from which the wheat has been removed is then planted to soybeans. Most of the remaining areas are used for grasses and legumes that are pastured or mowed for hay. Wheat, soybeans, most of the grain sorghum, and corn are sold as cash grain. The forage and some of the grain are fed to beef cattle and other livestock.

The soils in this association have good suitability for small grain, row crops, grasses, and legumes. Under highly specialized management, row crops can be grown year after year. The suitability is good for irrigated crops, especially high-value crops, but the availability of an adequate supply of water limits the acreage that can be irrigated.

Wheat, soybeans, sorghums, most of the common grasses, and legumes grow well on the soils in this association. Most of the soils have moderate available water capacity and a perched high water table during winter and spring. More than half of these soils have a dense fragipan at a depth of 18 to 36 inches that limits the root zone. The main management concerns are

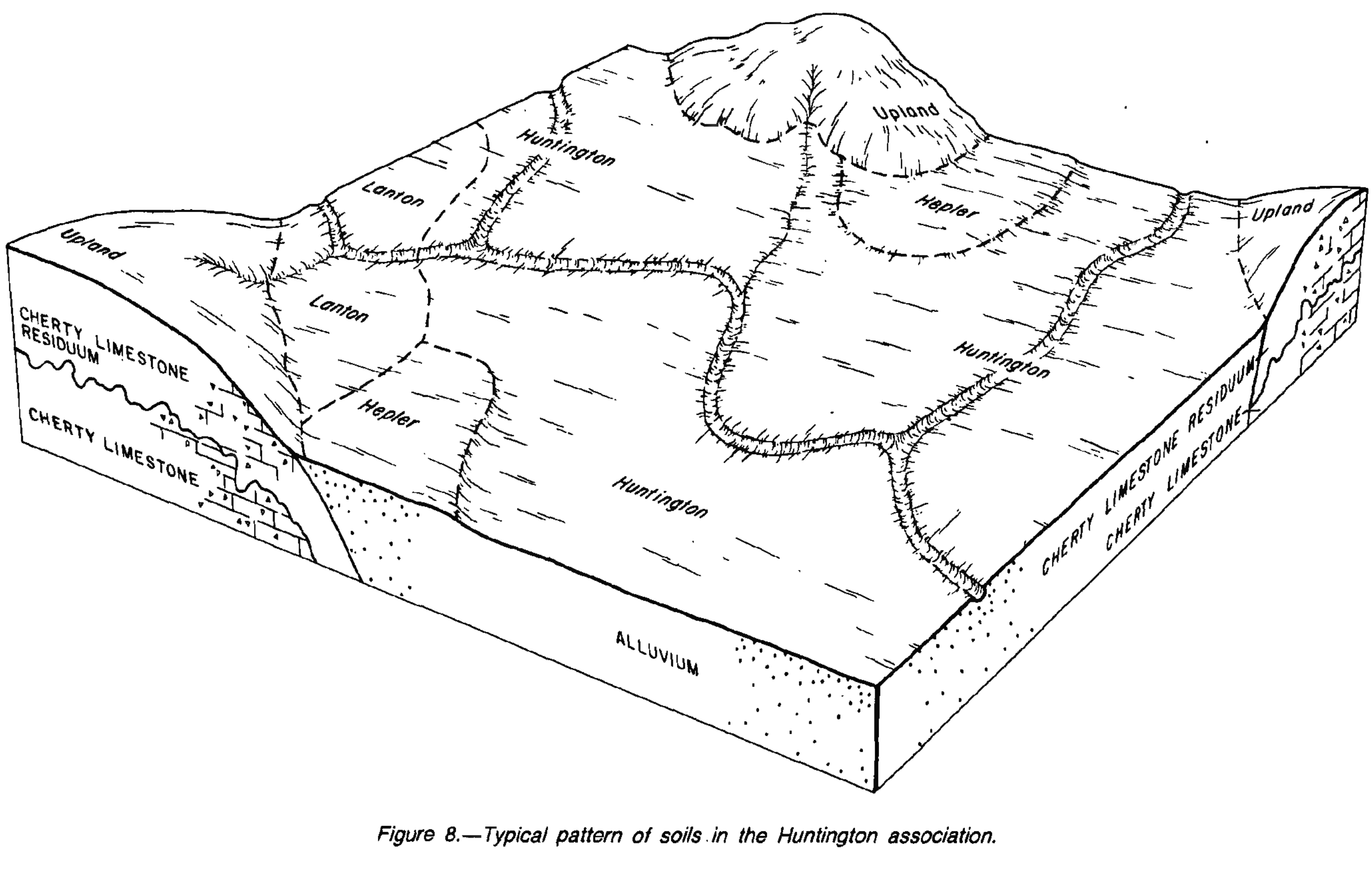

Figure 8.—Typical pattern of soils in the Huntington association.

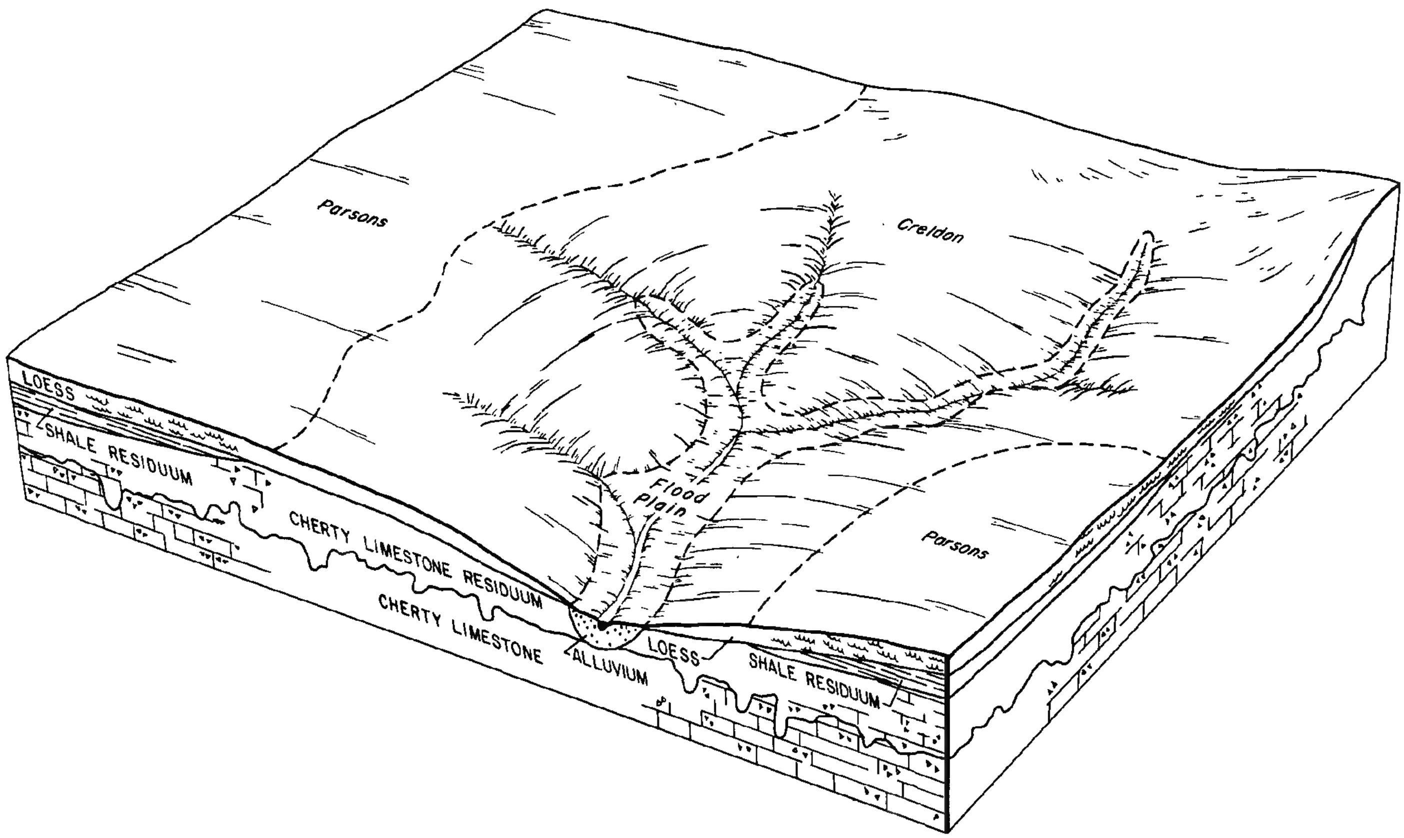

Figure 9.—Typical pattern of soils in the Creldon-Parsons association.

controlling erosion, especially in cropland on soils that have a slope of more than 2 percent, and the improvement of surface drainage of nearly level areas.

Most soils in this unit are suited to sanitary facilities and building site development. Major concerns are wetness, high shrink-swell potential, and shallow or moderate depth of the clayey subsoil.

9. Keeno-Creldon association

Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands

This association is only in Greene County. It consists of broad upland ridges, narrow flood plains, and terraces. In places, sinkholes are few to many. Slope of the major soils ranges from 2 to 9 percent.

This association makes up about 4 percent of Greene County, or about 2 percent of the survey area. Keeno soils make up about 56 percent of this association, Creldon soils 25 percent, and soils of minor extent 19 percent.

The Keeno soils are on the sides and tops of ridges on uplands. These soils are deep, moderately well drained, and gently sloping and moderately sloping. They formed in residuum weathered from cherty limestone. Typically, the surface soil is dark brown cherty silt loam about 17 inches thick. The subsoil above the fragipan is dark brown, mottled very cherty silt loam and very cherty silty clay loam about 13 inches thick. The fragipan is pale brown and reddish brown, mottled very cherty silt loam about 15 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red very cherty clay.

The Creldon soils are on the tops and sides of ridges on uplands. These soils are deep, moderately well drained, and gently sloping. They formed in thin loess and residuum weathered from cherty limestone. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil above the fragipan is about 15 inches thick. The upper part is dark brown, mottled silty clay loam, and the lower part is grayish brown and dark grayish brown, mottled silty clay loam. The fragipan is mottled red, grayish brown, and dark gray silty clay loam and cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a depth of 67 inches is dark red cherty silty clay and yellowish brown and dark red cherty clay.

Of minor extent in this association are the Pembroke, Eldon, Cedargap, Hepler, Lanton, and Goss soils. They make up about 93 percent of the minor soils. The gently sloping, well drained Pembroke soils are on ridges on uplands and terraces. The moderately sloping and strongly sloping Eldon and Goss soils are on uplands. The nearly level, somewhat excessively drained and well drained Cedargap soils and somewhat poorly drained and poorly drained Lanton soils are on flood plains. The nearly level, somewhat poorly drained Hepler soils are on low terraces.

About 80 percent of the areas in this association is used for grasses and legumes. Most of the remaining areas are used for cultivated small grain and row crops. A few isolated areas are in woodland. The forage and most of the grain are fed to beef and dairy cattle and other livestock. Wheat, soybeans, some corn, and grain sorghum are sold as cash grain.

The suitability of the soils in this association for grasses and legumes is good. About 30 percent of the areas is well suited to soybeans, grain sorghum, and corn.

Most of the common grasses, legumes, and small grain grow well on the soils in this association. Common row crops also grow well on Creldon soils and on the Pembroke, Eldon, and Cedargap soils of minor extent. Most soils in this association have low or moderate available water capacity. They also have a dense fragipan at a depth of 18 to 36 inches that limits the root zone and causes a perched high water table during winter and spring. The main management concerns are controlling erosion, especially in cropland on soils that have slope of more than 2 percent, and droughtiness.

The major soils in this unit are suited to sanitary facilities and building site development. The major concern is wetness.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Cedargap silt loam is one of two phases in the Cedargap series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils, miscellaneous areas, or soil and miscellaneous areas that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Clarksville-Nixa cherty silt loams, 5 to 14 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Parsons and Sampsel silt loams, 1 to 3 percent slopes, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimilar soils are described in each map unit.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and Dumps is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some mines and quarries in the survey area that are too small to be delineated are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

1B—Newtonia silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on the tops and sides and in slight depressions of ridges on uplands. Individual areas range from about 10 acres to several hundred acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil to a depth of about 72 inches is dark brown, friable silty clay loam overlying reddish brown, friable silty clay loam in the upper part; red, firm silty clay loam in the middle part; and red, firm silty clay in the lower part. Some areas have slope of more than 3 percent. In places, the surface layer is brown or reddish brown, and in places it is less than 10 inches thick.

This Newtonia soil is moderately permeable, runoff is slow to medium, and available water capacity is high. The shrink-swell potential is moderate. The response to soil amendments is very good.

Most areas of this Newtonia soil are in cropland or pastureland. Some large areas are used for dwellings or other urban development. This soil is suited to cultivated crops, but moderate susceptibility to erosion is a concern of management. Because of the erosion the choice of crops is reduced, or moderate conservation practices are required. Grassed waterways and field terraces help control erosion where a high percentage of intensively

cultivated row crops is grown. Minimum tillage coupled with highly specialized management of row crops, small grain, and meadow crops grown in rotation also effectively control erosion. The proper utilization of crop residue helps maintain organic matter content and good tilth and increases available water.

Grasses and legumes grown for pasture and hay effectively help to control erosion. Overgrazing pasture increases the growth of weeds and reduces the yield of grasses and legumes. Pasture quality and soil condition, as well as forage production, can be improved by proper stocking, pasture rotation, timely deferment of grazing, and fertilization according to soil test.

This soil is suited to building site development and to most onsite waste disposal systems if proper design and installation procedures are used. Moderate shrink-swell potential and moderate permeability are factors to be considered in design. Septic tank absorption fields need to be enlarged to compensate for the moderate permeability. Community sewers should be used if available. Foundations of buildings and basement walls should be designed and constructed with adequate reinforcement to prevent structural damage from the shrinking and swelling of this soil. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by adding suitable base material. Embankments for farm ponds or lakes are difficult to pack and seal. Ponds commonly fail to hold water because of seepage or other reasons. Deep wells are dug in some places, and the water is piped to livestock or used for other purposes.

This Newtonia soil is in capability subclass IIe.

2B—Pembroke silt loam, 1 to 5 percent slopes. This deep, gently sloping, well drained soil is on the tops and sides and in slight depressions of ridges on uplands and stream terraces. Individual areas range from about 10 acres to several hundred acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil to a depth of about 72 inches is reddish brown and yellowish red, friable silty clay loam in the upper part; red, mottled, firm silty clay loam in the middle part; and dark red, very firm cherty clay in the lower part. The surface layer in eroded areas or spots is brown or reddish brown silty clay loam. In places, the subsoil is cherty in the 30- to 40-inch zone. Also in places, the upper 20 inches of the subsoil is silty clay. Short steep slopes or terrace escarpments adjacent to flood plains and other slope breaks have gradient of more than 5 percent.

Included with this soil in mapping and making up 10 percent of mapped areas are Creldon and Eldon soils. These soils are on positions similar to those of the Pembroke soils. The Creldon soils have a fragipan; Eldon soils are cherty and steeper.

This Pembroke soil is moderately permeable, runoff is medium, and available water capacity is high. The shrink-swell potential at a depth of more than 30 to 50 inches is moderate. The response to soil amendments is very good.

Most areas of this soil are in cropland and pastureland. A large acreage is used for dwellings or other urban development. Moderate susceptibility to erosion is a concern of management if this soil is used for cultivated crops. If row crops dominate the crop sequence, grassed waterways and field terraces are commonly used to help control erosion. In rotations that include small grain and meadow, minimum tillage combined with other highly specialized management practices effectively control erosion. The proper use of residue helps maintain good tilth and increase available water.

Grasses and legumes grown for hay and pasture effectively and economically help to control erosion. Overgrazing increases the growth of weeds, reduces the yield of grasses and legumes, and increases surface runoff. Proper stocking rates, pasture rotation, and the timely deferment of grazing along with fertilization as needed improve pasture quality and forage production.

This soil is suited to trees. The trees can be grown for building material, fuel, shade, landscaping, or other uses. Both hardwoods and conifers thrive, and concerns in management are few and easy to remedy.

This soil is suited to building site development and to most onsite waste disposal systems if proper design and installation procedures are used. Moderate shrink-swell potential at a depth of 30 to 40 inches is the main factor to be considered in the design of buildings. Community sewers should be used if available. Foundations of buildings and basement walls should be designed and constructed with adequate reinforcement to prevent structural damage caused by shrinking and swelling of this soil. This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by adding suitable base material. Embankments for farm ponds or lakes are difficult to pack and seal. Ponds commonly fail to hold water because of seepage or other reasons. Deep wells are dug in places, and the water is piped to livestock or used for other purposes.

This Pembroke soil is in capability subclass IIe and woodland suitability subclass 3o.

3D—Eldon cherty silt loam, 5 to 14 percent slopes. This deep, moderately sloping and strongly sloping, well drained soil is on the convex sides and the tops of ridges on uplands. Individual areas range from about 10 acres to 100 acres or more. Many areas have a few to numerous sinkholes, and some areas have a few stones on the surface.

Typically, the surface layer is dark brown cherty silt loam about 10 inches thick (fig. 10). The subsoil to a depth of about 72 inches is reddish brown, friable and firm very cherty silty clay loam in the upper part; dark red, firm very cherty silty clay in the middle part; and dusky red, very firm clay in the lower part. In places, the surface layer is less than 6 inches thick, or it is brown.

The clay content of the upper part of the subsoil averages less than 35 percent in places. Side slopes near the low perimeter of some areas, especially the side slopes of sinkholes, have scarped edges and slope of more than 14 percent; some of these areas have bedrock at a depth of 40 to 60 inches. Also, some small areas are stony.

Included with this soil in mapping and making up as much as 5 percent of mapped areas are Keeno, Creldon, Gasconade, and Pembroke soils. Small areas of Rock outcrop are also included. The Creldon and Keeno soils have a fragipan and are on ridgetops. The shallow Gasconade soils are on the slope breaks, and Rock outcrop is on slope breaks and side slopes of sinkholes. The Pembroke soils do not have chert and are in gently sloping areas.

Figure 10.—Profile of Eldon cherty silt loam, 5 to 14 percent slopes. Note the decrease in chert content in the lower part of the subsoil. Depths are shown in feet.

This Eldon soil is moderately permeable, runoff is medium, and available water capacity is low. The shrink-swell potential is moderate. The response to soil amendments is good.

Most areas of this soil are in pastureland and hayland. The soil is suited to grasses, alfalfa or other legumes, and small grain forage. It is suited to grain crops if erosion is controlled. The moderately sloping areas of this soil are suitable for soybeans, sorghums, or corn if these crops are grown in rotations that include several years of pasture or hay crops. The proper use of crop residue and cover crops and green manure crops in the cropping sequence help maintain the organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and farming on the contour help to control erosion and retard runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Tillage operations should be restricted to stand establishment, renovation, and reseeding. New stands need to be seeded early to insure good ground cover. Nurse crops of small grain help provide cover for seedings late in fall. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and forage production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing. Weedy areas should be clipped in June and August. Chemical sprays help control broad-leaved weeds.

This soil is suited to building site development and to some onsite waste disposal systems if proper design and installation procedures are used. Factors to be considered are slope of more than 8 percent, moderate shrink-swell potential in the clayey subsoil, and chert and a few stones on the surface. Septic tank absorption fields should be enlarged to compensate for the moderate permeability in this soil. Slope can be modified by grading for sewage lagoons. Community sewers should be used if available. Structural damage to basement walls and foundations of buildings, caused by shrinking and swelling in this soil, can be prevented if the basement walls and foundations are properly designed and constructed with adequate reinforcement. Local roads and streets should have suitable base material and be properly drained by side ditches and culverts to prevent damage from shrinking and swelling and frost action. Embankments for farm ponds and sewage lagoons are very difficult to pack and seal. Because the limestone residuum under the soils in this unit is thin, porous, and transmits water freely, farm ponds must be properly constructed to insure that water will be retained (*12*). Porosity and permeability of this soil can be reduced by use of compaction equipment, artificial sealants, and deflocculating agents.

This Eldon soil is in capability subclass IVs.

5C—Wilderness cherty silt loam, 2 to 9 percent slopes. This deep, gently sloping and moderately

sloping, moderately well drained soil is on the convex sides and tops of ridges on uplands. Individual areas range from about 20 acres to several hundred acres. Some areas have small and large sinkholes. Coarse fragments of chert are on the surface.

Typically, the surface layer is dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is brown cherty silt loam about 8 inches thick. The subsoil above the fragipan is about 11 inches thick. The upper part is yellowish brown, friable cherty silt loam, and the lower part is brown and strong brown, firm cherty silty clay loam. The fragipan is about 35 inches thick. The upper part is pale brown, firm, cherty silt loam, and the lower part is mottled, multicolored, firm very cherty silty clay loam. The subsoil below the fragipan is dark red, very firm cherty clay to a depth of 72 inches. Small areas adjacent to the lower perimeter of some mapped areas have scarped edges or slope of more than 9 percent. Some small areas are stony.

Included with this soil in mapping and making up 5 to 15 percent of mapped areas are Goss, Peridge, and Viraton soils and Rock outcrop. The Goss soils do not have a fragipan. The Peridge and Viraton soils are not cherty in the upper part. All of these soils are on positions that are similar.

This Wilderness soil is moderately permeable above the fragipan and slowly permeable in the fragipan. Runoff is medium, and available water capacity is low. A perched water table is at a depth of 1 foot to 2 feet from December through March in most years. The root zone is limited by the fragipan at a depth of 15 to 29 inches. The response to soil amendments is fair.

Most areas of this soil are in tall fescue pasture or native black oak and post oak woodland. If erosion is controlled, the soil is suited to small grain, sorghums, or other row crops. Growing row crops in a rotation that includes several years of pasture or hay crops helps to control erosion. The proper use of crop residue, cover crops, and green manure crops helps to maintain organic matter content, provide good tilth, and increase the available water. Terraces, grassed waterways, minimum tillage, and contour cultivation help to control erosion and retard runoff.

This soil is suited to grass and legume pasture and hay crops. These crops effectively help to control erosion. Tillage operations should be restricted to stand establishment, renovation, or reseeding. Seeding new stands early insures good ground cover before the end of the growing season. Nurse crops of small grain provide cover in fall and winter before late seedings of grasses and legumes are established. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and forage production can be improved by proper fertilization, stocking rates, pasture rotation, and timely deferment of grazing.

This soil is suited to trees. Many areas have a stand of native hardwoods. Windthrow hazard and seedling mortality are moderate management concerns. Lighter, less intensive, and more frequent thinnings to reduce stand density can minimize windthrow damage. Planting special stock of a larger size than normal or planting containerized stock helps to achieve better survival rates. Fire protection and controlled grazing are included in good management.

This soil is suited to building site development and to some onsite waste disposal systems. Factors to be considered in design are slope, seasonal wetness, and restricted permeability caused by the presence of a fragipan at a depth of 15 to 29 inches. Sewage lagoons function properly if the area is graded to modify the slope. Using surface soil or other desirable material in a properly constructed mound to increase the thickness of the soil above the fragipan helps to make this soil suitable for septic tank absorption fields (*3*). However, community sewers should be used if available. Waterproofing the outside of foundations and basement walls and using drainage tile in the construction of buildings help to prevent damage caused by excessive wetness. Proper drainage of local roads and streets by side ditches and culverts helps prevent damage from excessive wetness and frost action.

This Wilderness soil is in capability subclass IVs and woodland suitability subclass 4d.

6B—Creldon silt loam, 1 to 4 percent slopes. This deep, gently sloping, moderately well drained soil is on the tops and sides of ridges on uplands. Individual areas are rounded or irregular in shape and range from about 20 acres to 300 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil above the fragipan is about 15 inches thick (fig. 11). The upper part is dark brown, mottled silty clay loam; and the lower part is grayish brown and dark grayish brown, mottled, firm silty clay loam. The fragipan is mottled red, grayish brown, and dark gray silty clay loam and cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a depth of 67 inches is dark red, firm cherty silty clay and yellowish brown and dark red, very firm cherty clay. In many places, the subsoil above the fragipan has less than 35 percent clay. Also in places, the subsoil has less clay than in this typical profile and has 15 percent or more fine sand or coarser sand, and coarse fragments.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Gerald and Parsons soils. Small areas of Keeno soils are in some places. The nearly level Gerald and Parsons soils are on the tops of broad ridges. They have more clay in the upper part of the subsoil than this Creldon soil and are somewhat poorly drained. The Parsons soils do not have a fragipan. The Keeno soils are on isolated knolls or other breaks and are cherty throughout.

This Creldon soil is moderately permeable above the fragipan and slowly permeable in the fragipan. Runoff is

medium, and available water capacity is moderate. A perched water table is at a depth of 1.5 to 3 feet from

Figure 11.—Profile of Creldon silt loam, 1 to 4 percent slopes. Note clay accumulation in the subsoil above the fragipan. Depths are shown in feet. Photo courtesy of C. L. Scrivner, University of Missouri Agricultural Experiment Station.

December through April in most years. The root zone is limited by a fragipan at a depth of 18 to 36 inches. The response to soil amendments is good.

Most areas of this soil are in cropland and pastureland. Most commonly grown crops are suited, but they are moderately susceptible to erosion. Seasonal wetness is a concern of management. Even though available water capacity is moderate, insufficient soil moisture in summer is commonly a limitation for crops. This reduces the choice of crops. Moderate conservation practices are needed. Small grain, soybeans, sorghums, grasses, legumes as grain, and forage crops can be grown in rotations. The proper use of crop residue and the use of cover crops and green manure crops in the cropping sequence help to maintain organic matter content, provide good tilth, and increase available water capacity. Supplemental irrigation is suited, but the availability of an adequate water supply is generally limited. Terraces, grassed waterways, minimum tillage, and farming on the contour help to control erosion and retard runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Grazing when these soils are too wet causes surface compaction, poor tilth, and excessive runoff. Forage quality, soil condition, and forage production can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and restricting use during wet periods.

This soil is suited to building site development and to some onsite waste disposal systems. Factors to be considered in design are seasonal wetness and restricted permeability caused by the fragipan at a depth of 18 to 36 inches. Sewers should be connected to community systems, if available, or to suitably located, designed, and constructed sewage lagoons. Increasing the thickness of soil layers above the fragipan in a properly constructed mound or removing fragipan layers and backfilling with surface soil or other desirable material helps make this soil suitable for septic tank absorption fields (*3*). Damage from excessive wetness can be prevented by the proper use of drainage tile in the design and construction of basement walls, foundations, and footings of dwellings or small commercial buildings. Grading, land smoothing, and ditches improve surface drainage in some places. Suitable base material is needed for local roads and streets to prevent damage caused by low strength.

This Creldon soil is in capability subclass IIe.

9B—Needleye silt loam, 1 to 3 percent slopes. This deep, very gently sloping, moderately well drained soil is on the tops, points, and side slopes near the crest of broad ridges on uplands. Individual areas range from about 10 acres to several hundred acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil above the fragipan is about 22 inches thick (fig. 12). The upper part is brown, friable silty clay loam; the middle part is yellowish brown and grayish brown, mottled, firm silty clay loam; and the lower part is light gray and dark gray, mottled, firm silty clay loam. The fragipan is yellowish brown and brown, mottled, firm very cherty silty clay loam about 9 inches thick. The subsoil below the fragipan is dark red and red, mottled, very firm cherty clay. In some small areas, the surface layer is cherty.

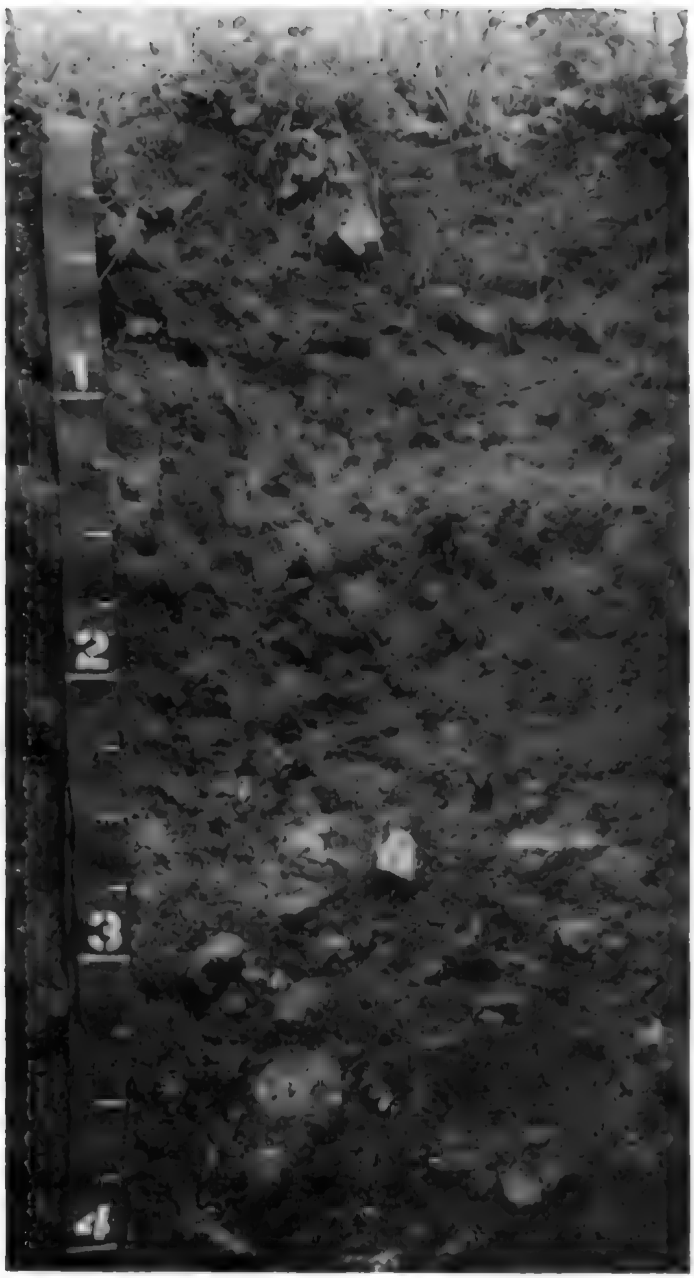

Figure 12.—Profile of Needleye silt loam, 1 to 3 percent slopes. The subsoil above the fragipan is high in silt and contains grayish mottles in the upper 10 inches. Depths are shown in feet.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Viraton and Bado soils. The small areas of Bado soils are on flats and in depressions and are poorly drained. The Viraton soils are on side slopes. They have more clay than this Needleye soil and do not have gray mottles in the upper 10 inches of the subsoil.

This Needleye soil is slowly permeable, and runoff is medium. A perched water table is at a depth of 1.5 to 3 feet from December through April in most years. The available water capacity is moderate. The root zone is limited by a fragipan at a depth of 18 to 36 inches. The response to soil amendments is good.

Most areas of this soil are in pastureland, cropland, and woodland. This soil is suited to most commonly grown crops but moderate susceptibility to erosion and seasonal wetness are concerns of management. Even though available water capacity is moderate, insufficient soil moisture is commonly a limitation to crops in summer. This reduces the choice of crops. Moderate conservation practices are needed. Small grain, grasses, legumes, soybeans, sorghums, and corn as forage and grain crops can be grown in rotations. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain organic matter content and good tilth and to increase available water. Terraces, grassed waterways, minimum tillage, and farming on the contour help to control erosion and retard surface runoff.

Grasses and legumes grown for pasture and hay effectively control erosion. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Grazing when this soil is too wet causes compaction, poor tilth, and excessive runoff. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods.

This soil is suited to trees. Stands of native hardwoods are common. Windthrow hazard and seedling mortality are moderate concerns of management. Lighter, less intensive, more frequent thinnings to reduce stand density can minimize windthrow damage. Planting special stock of a larger size than normal or planting containerized stock is needed to achieve better survival. Protection from fire and controlled grazing are included in good management.

This soil is suited to building site development and to some onsite waste disposal systems, but seasonal wetness and slow permeability caused by the fragipan at a depth of 18 to 36 inches are factors to be considered in design. Sewerlines should be connected to community systems, if available, or to suitably located, designed, and constructed lagoons. Increasing the thickness of the

soil layers above the fragipan in a properly constructed mound of surface soil or other desirable material helps to make this soil suitable for septic tank absorption fields (*3*). Drainage tile in the construction of basement walls, foundations, and footings of buildings helps to prevent damage from excessive wetness. Grading, land smoothing, and ditches improve surface drainage. Suitable base material is needed for local roads and streets to prevent damage caused by low strength of this soil.

This Needleye soil is in capability subclass IIe and woodland suitability subclass 4d.

10—Bado silt loam. This deep, nearly level, poorly drained soil is on flats or in slight depressions on the top of broad upland ridges that have slope of less than 2 percent. Individual areas range from about 5 acres to more than 600 acres.

Typically, the surface layer is dark grayish brown and grayish brown silt loam about 7 inches thick. The subsurface layer is light brownish gray silt loam about 5 inches thick. The subsoil above the fragipan is about 16 inches thick. The upper part is light brownish gray, mottled silty clay loam, and the lower part is dark grayish brown, mottled silty clay. The fragipan is about 23 inches thick. The upper part is yellowish brown, mottled very firm silty clay loam, and the lower part is mottled yellowish brown and gray, very firm cherty silty clay loam. The subsoil below the fragipan to a depth of 76 inches is mottled, multicolored, very firm very cherty silty clay.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Needleye and Viraton soils. The Needleye and Viraton soils are moderately well drained and are along the boundary of the map units at a slightly lower elevation than this Bado soil.

This Bado soil is very slowly permeable, and runoff is very slow or ponded. A perched water table is at the surface to a depth of 2 feet from December through April in most years. The available water capacity is moderate. The shrink-swell potential of the subsoil above the fragipan is moderate or high. The root zone is limited by a fragipan at a depth of 18 to 40 inches. The response to soil amendments is good.

Most areas of this soil are in fescue pasture and post oak and black oak woodland. A small acreage is in cropland. This soil is suited to grasses and legumes for hay and pasture. It is also suited to sudangrass, small grain, soybeans, and sorghums for forage and grain crops. Seasonal wetness is a concern of management. The available water capacity is moderate, but insufficient soil moisture is commonly a limitation to crops in summer. Surface runoff and seepage collect in depressions. The proper use of crop residue and the incorporation of cover crops and green manure crops in the cropping system help to maintain organic matter content, provide good tilth, and increase available water. Grading, land smoothing, surface ditches, and tile as needed improve drainage.

Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff. Pasture quality, soil condition, and forage production can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and restricting use during wet periods.

Stands of native hardwoods are in many areas of this soil. Plant competition and equipment limitation are severe management problems, and windthrow hazard and seedling mortality are moderate. Plant competition can be reduced by careful and thorough site preparation, including prescribed burning, spraying, or cutting. Release treatments may be necessary to ensure development. Equipment should be used in periods when the soil is dry or frozen. Lighter, less intensive, more frequent thinnings to reduce stand density can minimize windthrow damage. Ridging the soil and planting on the ridges help to increase seedling survival.

This soil is suited to building site development and sewage lagoons. Wetness because of the perched seasonal high water table, very slow permeability caused by the presence of a fragipan at a depth of 18 to 40 inches, and high shrink-swell potential in the clayey subsoil need to be considered in the design of structures. Sewerlines should be connected to properly designed and constructed sewage lagoons or community systems. Basement walls, foundations, and footings of buildings need to be properly designed and constructed with adequate reinforcement to prevent damage from shrinking and swelling of this soil. Tile drainage around footings and foundations helps prevent damage from excessive wetness. Local roads and streets should be graded to shed water, and side ditches and culverts need to be constructed to lower the water table and, thus, prevent damage from wetness and frost action. Suitable base material added to this soil helps to overcome low strength.

This Bado soil is in capability subclass IIIw and woodland suitability subclass 5w.

11B—Sampsel silty clay loam, 2 to 5 percent slopes. This deep, gently sloping, poorly drained soil is on the foot slopes, sides, and tops of low ridges on uplands. Individual areas range from 7 acres to more than 40 acres. Some areas are irregular in shape. Areas are commonly dissected by small intermittent stream channels.

Typically, the surface layer and subsurface layer are very dark gray silty clay loam about 13 inches thick. The subsoil is about 46 inches thick. The upper part is very dark gray, firm silty clay; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is mottled strong brown and dark gray, firm silty clay and mottled, multicolored, firm clay. The substratum to a depth of 66 inches is mottled, multicolored clay. In places, the surface layer is silt loam, or the lower part of the subsoil and substratum are cherty or gravelly.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Parsons and Gasconade soils, and, in Greene County, 5 to 10 percent Alsup soils. The moderately well drained Alsup soils are on the higher foot slopes. The nearly level Parsons soils are on the tops and sides of broad ridges, and the shallow Gasconade soils are on slope breaks.

This Sampsel soil is slowly permeable, and surface runoff is medium. A perched water table is at the surface to a depth of 1.5 feet from November to April in most years. The available water capacity is moderate. Shrink-swell potential is high. The response to soil amendments is good.

Most areas of this soil are in pastureland or hayland. Some areas are in cultivated cropland, and a few areas are in woodland. This soil is suited to row crops, but susceptibility to erosion, dissection by stream channels, and the relatively small or irregular shaped areas are concerns of management. Seepage and surface runoff from adjacent uplands can be diverted by dikes or large terraces. Erosion can be controlled by filling and smoothing areas dissected by gullies and small intermittent stream channels and by constructing grassed waterways and field terraces. The proper utilization of crop residue helps to maintain organic matter content, provide good tilth, and increase available water.

Grasses and legumes grown for pasture and hay effectively control erosion on this Sampsel soil. Overgrazing pasture reduces the yields of grasses and legumes and increases the growth of weeds. Grazing when the soil is wet causes compaction, poor tilth, and increased surface runoff. Pasture quality, soil condition, and forage production can be improved by proper stocking rates, pasture rotation, timely deferment of grazing, fertilization as needed, and restricted use when the soil is wet.

This soil is suited to building site development and onsite waste disposal if proper design and installation procedures are used. High shrink-swell potential, wetness, slow permeability, clayey subsoil layers, and slope are factors to be considered in design. Surface runoff from adjacent uplands can be controlled by diversion terraces. Sewerlines should be connected to suitable lagoons or community sewers. Footings, foundations, and basement walls of buildings need to be properly designed and constructed with adequate reinforcement to prevent damage caused by shrinking and swelling of the soil. Tile drains around footings and foundations help prevent damage from excessive wetness. Local roads and streets should be graded to shed water, and side ditches and culverts need to be constructed to lower the water table and, thus, prevent damage caused by frost action and shrinking and swelling. Adding suitable base material helps overcome the low strength of this soil.

This Sampsel soil is in capability subclass IIe.

16B—Barco fine sandy loam, 2 to 5 percent slopes. This moderately deep, gently sloping, well drained soil is on convex tops, sides, and foot slopes of ridges on uplands. Individual areas range from about 10 acres to 40 acres or more.

Typically, the surface layer is very dark grayish brown fine sandy loam about 11 inches thick. The subsoil is about 26 inches thick. The upper part is brown and yellowish brown, friable loam; the middle part is yellowish brown, mottled, friable sandy clay loam; and the lower part is yellowish brown and yellowish red, friable sandy loam. The substratum to a depth of 60 inches is yellowish red and brownish yellow soft sandstone and thin discontinuous lenses of clayey shale. In places, the surface layer is loam. Eroded areas on some side slope breaks have a dark colored surface layer less than 6 inches thick.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Collinsville soils; transitional belts between prairie and forest areas are as much as 5 percent Basehor soils. The Collinsville and Basehor soils are on or near the breaks of side slopes and are shallow to bedrock. The Basehor soils are mainly stony and have a lighter colored or thinner dark colored surface layer than this Barco soil.

This Barco soil is moderately permeable, runoff is medium, and available water capacity is low. The root zone is limited by sandstone at a depth of 20 to 40 inches. The response to soil amendments is good.

Most areas of this soil are in cultivated cropland and pasture. This soil is suited to the production of grasses, legumes, and small grain for forage and grain. It is also suited to alfalfa, soybeans, sorghums, and corn for cash grain and feed crops. High susceptibility to erosion and moderate root zone depth are concerns of management if this soil is used for cultivated crops. The available water capacity is moderate; however, insufficient soil moisture is a common limitation for crops in summer. The proper use of crop residue and including cover crops and green manure crops in the cropping system help maintain the organic matter content, provide good tilth, and increase available water. Terraces, grass waterways, minimum tillage, and farming on the contour help to control erosion and retard runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and other good management practices.

This soil is suited to building site development, but it has severe limitations for sanitary facilities. Sewerlines should be connected to community sewers or to properly constructed lagoons. Generally, adjacent areas that are suitable can be used for the sewage lagoon. Increasing the thickness of the absorption field above the bedrock

by properly constructing a mound of desirable material makes this soil suitable for septic tank absorption fields (*3*). The basement walls, foundations, and footings of buildings need to be properly designed and constructed with adequate reinforcement to prevent damage by moderate shrinking and swelling in the lower part of the subsoil. Local roads and streets should be graded to shed water, side ditches and culverts need to be properly constructed, and suitable base material needs to be added to provide drainage and prevent damage caused by low strength and shrinking and swelling of the soil.

This Barco soil is in capability subclass IIe.

21B—Peridge silt loam, 2 to 5 percent slopes. This deep, gently sloping, well drained soil is on the tops and sides and in slight depressions of ridges on uplands and stream terraces. Individual areas range from about 5 acres to 200 acres or more.

Typically, the surface layer is brown silt loam about 9 inches thick (fig. 13). The subsoil to a depth of about 72 inches is reddish brown, friable and yellowish red, firm silty clay loam in the upper part; red, mottled, firm silty clay loam in the middle part; and dark red, mottled, very firm cherty clay in the lower part. In places, the surface layer is dark brown. Also in a few places, the surface layer is loam or fine sandy loam. Severely eroded spots have a surface layer of brown and reddish brown silty clay loam. In places, the upper part of the subsoil is silty clay. Also in places, the subsoil is cherty in the 30- to 40-inch zone. Short, steep slopes adjacent to flood plains and other slope breaks have gradient of more than 5 percent.

Included with this soil in mapping and making up 10 percent of the mapped areas are Viraton soils; making up 5 percent are Goss soils. Also included are small areas of Alsup and Freeburg soils in the northeastern and east-central parts of Greene County. The Viraton soils have a fragipan and are on the tops and side slopes of ridges at a higher elevation than this Peridge soil. The Alsup soils are high on stream terraces and foot slopes and have more clay in the upper part of the subsoil. The Goss soils are on the tops and side slopes of low ridges and have more clay and coarse fragments. The Freeburg soils have gray mottles in the upper 10 inches of the subsoil and are somewhat poorly drained.

This Peridge soil is moderately permeable, runoff is medium to slow, and available water capacity is high. Shrink-swell potential in the lower part of the subsoil is moderate. The response to soil amendments is very good.

Most areas of this soil are in cropland and pastureland. A few areas are in woodland. Considerable acreage is used for dwellings and other urban development. This soil is suited to cropland, but moderate susceptibility to erosion is a concern of management. Minimum tillage and careful management effectively control erosion in most areas if small grain and meadow are dominant crops. If row crops are

Figure 13.—Profile of Peridge silt loam, 2 to 5 percent slopes. The surface soil and subsoil are high in silt. Depths are shown in feet.

dominant in the cropping sequence, grassed waterways and field terraces are commonly needed. Grasses and legumes help control erosion on short steep slopes, escarpments, and eroded areas. The proper utilization of crop residue helps to maintain the organic matter content, provide good tilth, and increase available water.

Grasses and legumes grown for pasture and hay economically and effectively control erosion. Early seeding, especially on problem areas such as short steep slopes, escarpments, and eroded places, helps to establish new stands before the end of the growing season. Nurse crops of small grain help provide cover in fall and winter for late seedings. Overgrazing reduces the yield of grasses and legumes and increases surface runoff and the growth of weeds. Pasture quality and production can be improved by proper stocking rates, pasture rotation, timely deferment of grazing, and fertilization according to soil test.

This soil is suited to trees. Stands of hardwoods are in a few areas. Timber production and quality can be improved by removal of undesirable trees, selective cutting, protection from fire, and controlled grazing. Concerns of management are few and easy to remedy.

This soil is suited to building site development and to most onsite waste disposal systems if proper design and installation procedures are used. Septic tank absorption fields should be enlarged to compensate for the moderate permeability. Community sewers should be used if available. Foundations and basement walls of buildings can be designed and constructed with adequate reinforcement to prevent structural damage caused by the shrinking and swelling of the subsoil. Local roads and streets need suitable base material to overcome the low strength of this soil. Embankments for farm ponds or lakes are difficult to pack and seal. Ponds commonly fail to hold water because of seepage or other reasons. Deep wells are dug in places, and the water is piped to livestock or used for other purposes.

This Peridge soil is in capability subclass IIe and woodland suitability subclass 3o.

23B—Bolivar fine sandy loam, 2 to 5 percent slopes. This moderately deep, gently sloping, well drained soil is on convex tops, sides, and foot slopes of ridges on uplands. Individual areas range from about 10 to more than 40 acres.

Typically, the surface soil is brown fine sandy loam about 11 inches thick. The subsoil is about 21 inches thick. The upper part is strong brown, friable loam; the middle part is strong brown and reddish brown, mottled, firm clay loam; and the lower part is mottled, multicolored, friable sandy clay loam. The substratum to a depth of 60 inches is yellowish red and brownish yellow soft sandstone and thin discontinuous lenses of shale. Eroded small areas on the breaks of some side slopes have a surface layer less than 6 inches thick and slope of more than 5 percent. Some areas have a dark surface layer more than 10 inches thick.

Included with this soil in mapping and making up as much as 10 percent of mapped areas are Basehor soils; transitional belts between forest and prairie areas are as much as 5 percent Collinsville soils. The Basehor and Collinsville soils are on or near the breaks of side slopes and are shallow to bedrock. The Basehor soils are stony.

This Bolivar soil is moderately permeable, runoff is medium, and available water capacity is low. The root zone is limited by sandstone at a depth of 20 to 40 inches. The response to soil amendments is good.

Most areas of this soil are in pastureland, cropland, and woodland. This soil is suited to grasses, legumes, and small grain. High susceptibility to erosion and moderate root zone depth are concerns of management. Even though available water capacity is moderate, insufficient soil moisture commonly is a limitation to crops in summer. This reduces the choice of crops. Special conservation practices are required. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and farming on the contour help to control erosion and retard runoff.

Growing grasses and legumes for hay and pasture effectively controls erosion. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and other good management.

This soil is suited to trees. Stands of native hardwoods are in many areas. Moderate root zone depth results in a moderate growth rate and fair quality. Concerns of management are easy to overcome. Growth rate and quality of timber can be improved by the removal of undesirable trees, protection from fire, fencing to control grazing, and other good woodland management.

This soil is suited to building site development. It has severe limitations for sanitary facilities; however, properly designed sewage lagoons function adequately. Extra soil material is needed for some lagoons because of the moderate depth to bedrock. Generally, suitable borrow material from adjacent areas can be used. A properly constructed mound of desirable material above the bedrock increases thickness of the absorption field and makes this soil suitable for septic tanks (*3*). Community sewers should be used if available. Basement walls, foundations, and footings of dwellings and other buildings need to be properly designed and constructed with adequate reinforcement to prevent damage caused by moderate shrinking and swelling in the lower part of the subsoil. Local roads and streets should be graded to shed water and side ditches and culverts constructed to insure drainage. Suitable base material needs to be added to prevent damage caused by low strength and shrinking and swelling.

This Bolivar soil is in capability subclass IIIe and woodland suitability subclass 4o.

24—Parsons silt loam. This deep, nearly level, somewhat poorly drained soil is on the tops and sides of broad ridges on uplands. Slope is mainly less than 1 percent but ranges from 0 to 2 percent. Individual areas are large, smooth, and suited to large machinery. Some areas are more than a mile wide and several miles long.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part is very dark grayish brown, mottled, very firm clay, and the lower part is multicolored, very firm clay. The substratum to a depth of 66 inches is light brownish gray, mottled silty clay loam.

Included with this soil in mapping and making up as much as 10 percent of mapped areas are Gerald soils; making up as much as 5 percent are Carytown, Creldon, and Sampsel soils. These soils are on landscape positions similar to those of the Parsons soil. The Gerald soil is on the tops and points of ridges that are about 100 to 300 yards wide. Creldon, Sampsel, and some Gerald soils are on side slopes adjacent to or near the low perimeter of areas. The Gerald and Creldon soils have a fragipan, and Sampsel soils have a thicker, dark colored surface layer. The poorly drained Carytown soils, in depressions and on low side slopes, have a light colored surface layer and a subsoil high in sodium.

This Parsons soil is very slowly permeable, and runoff is slow. A perched water table is at a depth of 0.5 to 1.5 feet from December to April in most years. The available water capacity is moderate. Shrink-swell potential is high. The response to soil amendments is good.

Most areas of this Parsons soil are used for row crops and small grain. They are farmed with large farm machinery, and the crops are marketed as cash grain. Some areas are in pastureland. This soil is suited to cultivated crops, but wetness caused by a perched water table delays planting of crops early in some seasons. Long slopes that have a gradient of more than 1 percent are susceptible to erosion. This soil is better suited to soybeans, sorghum, and small grain than most other crops. Proper utilization of crop residue helps maintain organic matter content, provide good tilth, and increase available water. Supplemental irrigation is needed, but the availability of an adequate water supply is generally limited. Field terraces or cross slope channels and minimum tillage help to control erosion.

Wetness during winter and spring and low rainfall in summer are concerns of management if this soil is used for pasture. Grazing when the soil is wet causes poor tilth, compaction, and excessive runoff. Overgrazing reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and forage production can be improved by proper stocking rates, pasture rotation, timely deferment of grazing, fertilization as needed, and restricted use during wet periods.

This soil is suited to building site development and onsite waste disposal. Wetness, very slow permeability, and high shrink-swell potential are factors to be considered in the design of buildings. Grading, smoothing, and ditching improve surface drainage. Lagoons function adequately if properly constructed. Basement walls, footings, and foundations of buildings need to be properly designed and constructed with adequate reinforcement to prevent damage caused by shrinking and swelling. Drainage tile around footings and foundations of buildings helps to prevent damage from excessive wetness. Grading local roads and streets to shed water and constructing side ditches and culverts to lower the water table help to prevent damage caused by wetness and shrinking of the soil. Suitable base material should be added to overcome low strength.

This Parsons soil is in capability subclass IIs.

26D—Collinsville fine sandy loam, 2 to 14 percent slopes. This shallow, gently sloping to strongly sloping, well drained and somewhat excessively drained soil is on the sides, tops, and terminal points of ridges on uplands. In places, bedrock escarpments mark the lower boundary of strongly sloping and moderately sloping areas. Individual areas range from about 10 acres to 40 acres or more.

Typically, the surface layer is dark brown fine sandy loam about 10 inches thick. The substratum is brown, gravelly fine sandy loam about 3 inches thick. Yellowish brown hard sandstone, fractured at intervals of 6 to 18 inches, is at a depth of 13 inches. Some small and a few large areas are stony. In places, the dark surface layer is thinner or is lighter colored than typical.

Included with this soil in mapping and making up as much as 15 percent of mapped areas are Barco and Bolivar soils and Rock outcrop. The moderately deep, gently sloping Barco and Bolivar soils are on smooth, broad ridgetops; on foot slopes; and between breaks in the landscape. The Bolivar soils have a lighter colored or thinner, dark colored surface layer than this Collinsville soil. Rock outcrop is on ridgetop knobs and side slope breaks.

Permeability in this Collinsville soil is moderately rapid, runoff is medium to rapid, and available water capacity is very low. The root zone is limited by hard sandstone at a depth of less than 20 inches. The response to soil amendments is fair.

Most areas of this soil are in pastureland. This soil is suited to pasture; it is generally not suited to cultivated crops. Droughtiness, shallow root zone, susceptibility to erosion, stony areas, and rocky spots are major concerns of management.

Grasses and legumes grown for pasture effectively control erosion. Overgrazing reduces the forage yield and increases the growth of weeds. Good plant cover helps to control erosion, maintain organic matter content, and increase available water. Forage quality and production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This soil generally is not suited to building site development and sanitary facilities. In places, the layer of sandstone bedrock is thin and is underlain by cherty loamy or cherty clayey, limestone residuum that has moderate or slight limitations for sanitary facilities and moderate limitations for building site development. The sandstone bedrock can be economically removed in places. Some soils included in mapped areas or soils in nearby adjacent areas are suitable for building sites and onsite waste disposal. Onsite investigations are needed to make these determinations.

This Collinsville soil is in capability subclass VIs.

27D—Basehor stony fine sandy loam, 2 to 14 percent slopes. This shallow, gently sloping to strongly sloping, well drained soil is on the sides, tops, and terminal points of ridges on uplands. Sandstones 15 to 30 inches long, 8 to 20 inches wide, and 6 to 12 inches thick are spaced 5 to 100 feet apart on the surface in most parts of the landscape (fig. 14). Bedrock escarpments mark the lower boundary of many strongly sloping and some moderately sloping areas. Individual areas range from about 10 acres to several hundred acres.

Typically, the surface layer is dark brown and brown stony fine sandy loam about 3 inches thick. The subsoil is brown and strong brown, friable fine sandy loam about 10 inches thick. Yellowish brown hard sandstone, fractured at intervals of 1 to 3 feet, is at a depth of about 13 inches. Several small and some large, gently sloping and moderately sloping, stone-free areas are commonly between and around breaks in the landscape. Some small areas have a thicker, dark colored surface layer than typical. A few knobs and side slope breaks have outcrops of rock.

Included with this soil in mapping and making up as much as 15 percent of mapped areas are Bolivar and Barco soils. The moderately deep Bolivar and Barco soils are on smooth, broad ridgetops and narrow foot slopes.

Permeability in this Basehor soil is moderately rapid, runoff is medium or rapid, and available water capacity is very low. The root zone is limited by hard sandstone at a

Figure 14.—Woodland in an area of Basehor stony fine sandy loam, 2 to 14 percent slopes.

depth of less than 20 inches. The response to soil amendments is poor.

Most areas of this soil are in oak woodland and commonly are stony. Nonstony areas are mainly in pasture. This soil generally is used for grazing, wildlife habitat, and woodland. Cultivated crops are not suited because of stoniness, droughtiness, and the shallow root zone. It is impractical to use farm machinery in the stony areas; however, scattered, cleared nonstony areas can be mowed or tilled for pasture and hay crops. The cleared areas are better suited to grasses and legumes than most other crops.

Overgrazing pasture reduces the forage yield and increases the growth of weeds. Chemical sprays help to control brush and weeds. Good plant cover helps to control erosion, maintain organic matter content, and increase available water. Forage quality and production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This soil is generally suited to trees. Stands of native hardwoods are in many areas; however, low production of the woodland generally does not warrant intensive timber management. If trees are planted or existing timber harvested, seedling mortality, windthrow hazard, and, in stony areas, equipment limitation are moderate concerns of management. Lighter, less intensive, more frequent thinning of trees reduces stand density and, consequently, windthrow damage. Fire protection and controlled grazing help to provide adequate ground cover and prevent erosion.

This soil is suited to use as habitat for openland wildlife. Plant cover is fair, but forage for animals is scarce. Plantings of grain sorghum, legumes, grasses, blackberries, and shrubs increase the food supply and provide additional cover. Waste materials from land clearing and tree cutting formed into dense brush piles near the edge of the woodland can serve as secure winter cover.

This soil is generally not suited to building site development and onsite waste disposal because of the shallow depth to bedrock, stones on the surface, and slope. In places, the layer of sandstone bedrock is thin and is underlain by cherty loamy or cherty clayey, limestone residuum. Where the bedrock can be economically removed, limitations are moderate or slight for sanitary facilities and moderate for building site development. Some inclusions of other soils or soils in nearby adjacent areas are suitable for building sites and onsite waste disposal. Onsite investigations are needed to make these determinations.

This Basehor soil is in capability subclass VIIs and woodland capability subclass 5d.

30C—Keeno cherty silt loam, 2 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on convex sides and tops of ridges on uplands. Individual areas range from about 5 acres to several hundred acres. Coarse fragments of chert are on the surface.

Typically, the surface soil is dark brown cherty silt loam about 17 inches thick. The subsoil above the fragipan is dark brown, mottled, friable very cherty silt loam and very cherty silty clay loam about 13 inches thick (fig. 15). The fragipan is pale brown and reddish brown, mottled, very cherty silt loam about 15 inches thick. The subsoil below the fragipan to a depth of 72

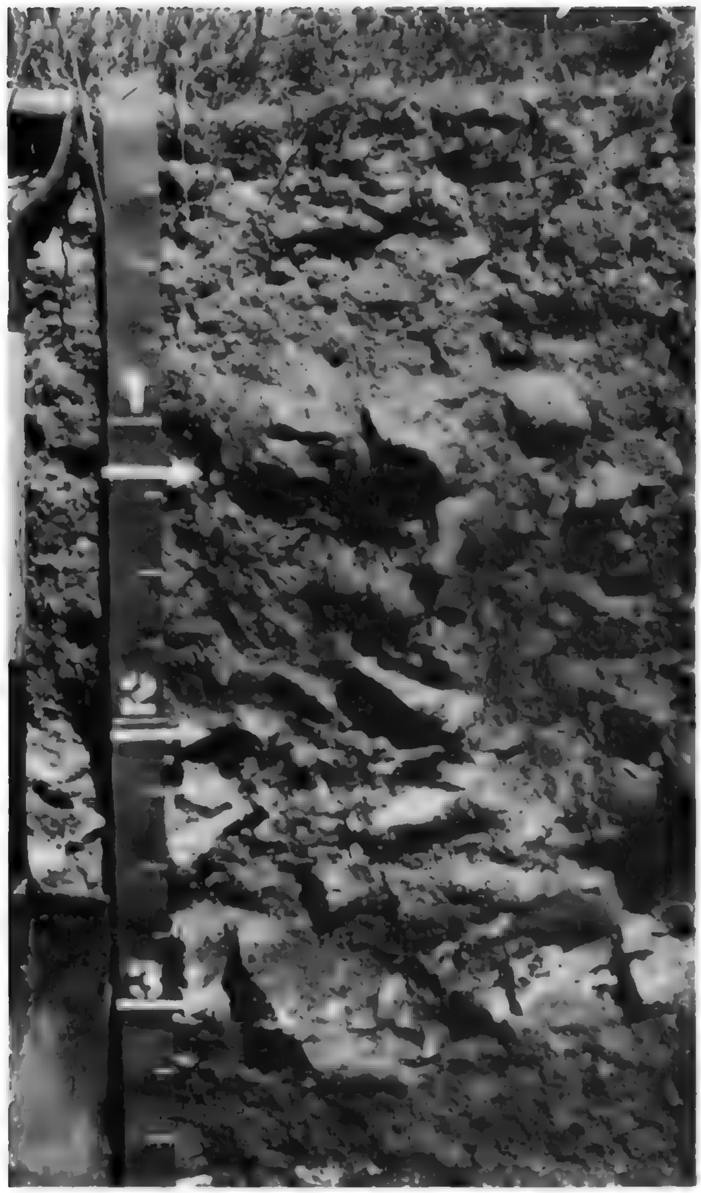

Figure 15.—Profile of Keeno cherty silt loam, 2 to 9 percent slopes. Note the thick cherty surface soil over a very cherty subsoil. Depths are shown in feet. Photo courtesy of C. L. Scrivner, University of Missouri Agricultural Experiment Station.

inches is dark red, very firm very cherty clay. Adjacent to the low perimeter of some areas, slope is more than 9 percent. In places, a few areas are stony.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Hoberg soils; making up as much as 5 percent are Creldon, Eldon, Newtonia, and Pembroke soils. The Creldon, Hoberg, and Pembroke soils have less chert in the surface layer and upper part of the subsoil than this Keeno soil. They are on the wider, gently sloping tops, points, and side slopes of ridges. The Eldon, Newtonia, and Pembroke soils do not have a fragipan; Eldon soils are on side slopes and points and in some areas that have more than 9 percent slopes; and Newtonia soils are on the tops and in slight depressions on ridges.

Permeability in this Keeno soil is moderately rapid above the fragipan and slow in the fragipan. Runoff is medium, and available water capacity is low. A perched water table is at a depth of 2.5 to 4.0 feet from December through March in most years. The root zone is limited by a fragipan at a depth of 18 to 36 inches. The response to soil amendments is good.

Most areas of this soil are used for grass and legume pasture and hay crops. Some areas are used for small grain, and a few are used for row crops. This soil is suited to grasses, legumes, and small grain for forage or grain. It is suited to small grain, soybeans, and sorghums if erosion is controlled. Erosion can be controlled and row crops can be grown in rotation with small grain if several years of pasture or hay crops are included in the cropping sequence. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and contour cultivation help to control erosion and retard runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Tillage operations should be restricted to stand establishment, renovation, or reseeding. New stands should be seeded early enough to insure good ground cover before the end of the growing season. Nurse crops of small grain provide cover late in fall and winter before the grasses and legumes are established. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and forage production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This soil is suited to building site development and to some onsite waste disposal systems. Factors to be considered are seasonal wetness and restricted permeability caused by the presence of a fragipan at a depth of 18 to 36 inches. Chert throughout the soil is a limitation for most sanitary facilities. Onsite investigations are needed to determine if some included soils are suitable sites for lagoons. Increasing the thickness of the absorption field above the fragipan by properly constructing a mound of desirable material helps make this soil suitable for septic tank absorption fields (*3*). Constructing side ditches along local roads and streets removes excess water and helps to prevent damage from frost action. Waterproofing the outside of foundations and basement walls and using drainage tile in the construction of buildings help prevent damage caused by excessive wetness.

This Keeno soil is in capability subclass IVs.

32C—Freeburg and Alsup silt loams, 2 to 9 percent slopes. This map unit consists of deep, gently sloping and moderately sloping, somewhat poorly drained Freeburg soils and moderately well drained Alsup soils. The Freeburg soils are on terraces along small streams or creeks, and the Alsup soils are on the adjacent foot slopes on uplands. The extent of the Freeburg and Alsup soils in individual areas varies widely from place to place; in some areas only one of these soils is present. Generally, areas are about 45 percent Freeburg soils and 25 percent Alsup soils. Individual areas range from less than 15 acres to 40 acres or more. Most areas are dissected by small stream channels. In some areas, the gently sloping Freeburg soils are subject to occasional flooding.

Typically, the surface layer of the Freeburg soil is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is grayish brown silt loam about 8 inches thick. The subsoil to a depth of about 72 inches is yellowish brown, mottled silty clay loam in the upper part and mottled, multicolored silty clay loam in the lower part. In places, the dark colored surface layer is 6 to 8 inches thick. Also in places, fragments of siltstone and chert are on the surface. In other places, the upper 10 inches of the subsoil does not have grayish brown mottles.

Typically, the surface layer of the Alsup soil is brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is strong brown and brown, firm silty clay loam in the upper part and yellowish red and red, mottled, very firm silty clay in the lower part. The substratum to a depth of 60 inches or more is mottled light yellowish brown and yellowish red silty clay loam. Wooded narrow bands adjacent to the high perimeter of some areas are stony or flaggy. In places, the surface layer is very dark grayish brown and about 6 to 8 inches thick. Also in places, the upper part of the subsoil has grayish brown or light brownish gray mottles.

Included with these soils in mapping and making up as much as 15 percent of mapped areas are Viraton, Peridge, and Sampsel soils. The Viraton and Peridge soils are on the tops, sides, and foot slopes of ridges on terraces and uplands. The Viraton soils have a fragipan; Peridge soils are well drained; and Sampsel soils are on plane or concave low ridges on uplands and have a thick, dark colored surface layer.

In these Freeburg and Alsup soils, permeability is moderately slow, and surface runoff is slow or medium.

Available water capacity is high in the Freeburg soils and moderate in the Alsup soils. A perched water table is at a depth of 1.5 to 4 feet from November to May in most years. The shrink-swell potential is high in the Alsup soils and moderate in the Freeburg soils. The response to soil amendments is good.

Most areas of these soils are in cropland or pastureland. Some areas are in woodland. A small acreage is used for small grain and row crops. These soils are suited to grasses and legumes. Concerns of management are the high susceptibility to erosion and wetness. Also of concern is occasional flooding in some areas of gently sloping Freeburg soils from April to July if they are cropped. Surface runoff from wooded or grass-covered adjoining upland can be controlled by diversion terraces. Grass waterways, land smoothing, field terraces, and minimum tillage help to control erosion. The proper utilization of crop residue provides good tilth, maintains the organic matter content, and increases available water.

Grasses and legumes grown for pasture and hay effectively control erosion. Tillage operations should be restricted to stand establishment, renovation, and reseeding. New stands need to be seeded early to establish good ground cover before the end of the growing season. Nurse crops of small grain provide fair to good fall and winter cover for late seedings. Overgrazing or grazing when these soils are wet reduces the stand of grasses and legumes, increases the growth of weeds, and causes poor tilth and compaction. Restricting the use of pasture in wet periods, fertilization as needed, proper stocking rates, pasture rotation, and timely deferment of grazing improve plant production, pasture quality, and soil condition.

These Freeburg and Alsup soils are suited to trees, and stands of hardwoods are in some areas. Concerns of management are few and easy to remedy. The growth rate is good. The production and quality can be improved by the removal of undesirable trees, selective cutting, protection from fire, and controlled grazing.

These soils are generally not suited to building site development and onsite waste disposal in areas that are subject to occasional flooding. Onsite investigation and previous flooding history are needed to determine whether the area is free from flooding or subject to flooding. In areas that are protected or free from flooding, factors to consider in the design of structures are wetness, high shrink-swell potential, and moderately slow permeability. Slope is a concern for sewage lagoons. Areas subject to surface runoff from adjacent areas can be protected with diversion terraces. Properly constructed sewage lagoons function adequately if protected from flooding, the bottom of the lagoon is sealed to prevent pollution of the ground water, and the site is graded to modify the slope. Community sewers should be used if available. The footings, foundations, and basement walls of buildings need to be designed and constructed with adequate reinforcement to prevent structural damage from shrinking and swelling of the soil. Drain tiles help prevent damage from excessive wetness. Local roads and streets should be graded to shed water and side ditches and culverts constructed to lower the water table and prevent damage caused by frost action and shrinking and swelling. Suitable base material needs to be added to overcome low strength.

These soils are in capability subclass IIIe; woodland capability subclass is 3o for Freeburg soils and 4o for Alsup soils.

33B—Keeno and Eldon cherty silt loams, 2 to 5 percent slopes. This map unit consists of deep, gently sloping, moderately well drained Keeno soils and well drained Eldon soils on the convex tops and side slopes of ridges on uplands. The Keeno soils are at a higher elevation and dominantly have slope of 2 or 3 percent; the Eldon soils are at a lower elevation and mainly have slope of 4 or 5 percent. The extent of Keeno and Eldon soils in individual areas varies widely from place to place; in some areas only one of these soils is present. Generally, areas are about 40 percent Keeno soils and 30 percent Eldon soils. Individual areas are irregular in shape and range from about 10 acres to 100 acres or more. Most areas have a few to many sinkholes. In some areas, a few stones are on the surface.

Typically, the surface layer of the Keeno soil in this unit is dark brown cherty silt loam about 11 inches thick. The subsoil above the fragipan is reddish brown and about 17 inches thick. The upper part is friable very cherty silt loam, and the lower part is friable very cherty silty clay loam. The fragipan is about 11 inches thick. It is mottled, multicolored very cherty silt loam overlying very cherty silty clay loam. The subsoil below the fragipan to a depth of 60 inches is dark red, mottled, very firm cherty clay. In some places, the fragipan is intermittent or very weakly developed. Side slopes have gradient of more than 5 percent in some places.

Typically, the surface layer of the Eldon soil in this unit is dark brown cherty silt loam about 8 inches thick. The subsoil to a depth of about 72 inches is brown, friable cherty silty clay loam in the upper part; red, mottled, firm very cherty silty clay loam in the middle part; and dark red and dusky red, very firm very cherty clay over cherty clay in the lower part. In places, the dark surface layer is less than 6 inches thick or is brown. In places, the average clay content in the upper part of the subsoil is less than 35 percent. The depth to bedrock is 40 to 60 inches on some hilltop knolls and low side slopes. The sides of some sinkholes have rock-scarped edges or slope of more than 5 percent, or both of these.

Included with these soils in mapping and making up as much as 10 percent of mapped areas are Pembroke soils; making up as much as 5 percent are Creldon, Gasconade, and Hoberg soils and Rock outcrop. The Creldon and Hoberg soils are on the tops of broad ridges at a relatively high elevation. The Pembroke soils are adjacent to drainageways and in slight depressions

on the tops and foot slopes of ridges. The shallow Gasconade soils and Rock outcrop are on slope breaks. Creldon and Hoberg soils have a fragipan; Hoberg and Pembroke soils have less chert in the upper part of the subsoil than the major soils.

Permeability in the Keeno soils is moderately rapid above the fragipan and slow in the fragipan. The Eldon soils are moderately permeable. The available water capacity is low, and surface runoff is medium for both soils. The Keeno soils have a perched water table at a depth of 2.5 to 4.0 feet from December through March in most years and have a limited root zone because of a fragipan at a depth of 18 to 36 inches. The Eldon soils have moderate shrink-swell potential. The response to soil amendments is good in both soils.

Most areas of these soils are in pastureland and hayland. Some areas are in cropland. These soils are suited to small grain, grasses, and legumes as grain and forage crops. Soybeans, sorghums, or corn can be grown safely if erosion is controlled. Erosion can be controlled in row crops by including several years of pasture or hay in the crop rotation. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and farming on the contour help to control erosion and retard runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Overgrazing pasture reduces the forage yield and increases the growth of weeds. Plant production, forage quality, and soil condition can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and the use of good management.

These soils are suited to building site development and to some onsite waste disposal systems. Wetness and restricted permeability in the Keeno soils, moderate shrinking and swelling in the Eldon subsoil, and the chert content and stones on the surface in both soils are factors to be considered in the design of dwellings and sanitary facilities. Increasing the thickness of the absorption field by properly constructing a mound of desirable material helps make the Keeno soils suitable for septic tank absorption fields (*3*). In Eldon soils the absorption field needs to be enlarged to compensate for the moderate permeability. Community sewers should be used if available. Structural damage to basement walls and foundations of buildings because of moderate shrinking and swelling of the soil can be prevented by proper design and the use of adequate reinforcement in structures. Grading local roads and streets and properly draining them with side ditches and culverts help prevent damage from frost action and shrinking and swelling. Because the limestone residuum under the soils in this unit is thin and porous and transmits water freely, farm ponds must be properly constructed to insure that water will be retained (*12*). Compaction equipment, artificial sealants, and deflocculating agents can be used to reduce the porosity and permeability of these soils.

These Keeno and Eldon soils are in capability subclass IVs.

35D—Clarksville-Nixa cherty silt loams, 5 to 14 percent slopes. This map unit consists of deep, moderately sloping and strongly sloping, somewhat excessively drained Clarksville soils and moderately sloping, moderately well drained Nixa soils on the sides and tops of ridges on uplands. Clarksville soils dominate the side slopes at a relatively lower elevation, and Nixa soils dominate the ridgetops. Generally, areas are about 60 percent Clarksville soils and 20 percent Nixa soils. Individual areas range from about 20 acres to several hundred acres. Large areas are dissected by many upland drainageways, narrow flood plains, and terraces. Some areas have rock-scarped edges adjacent to stream bottoms and terraces.

Typically, the surface layer of the Clarksville soil is very dark grayish brown cherty silt loam about 4 inches thick. The subsurface layer is yellowish brown cherty silt loam about 5 inches thick. The subsoil to a depth of 72 inches is brown, friable very cherty silt loam in the upper part; strong brown, mottled, firm very cherty silty clay loam in the middle part; and dark red, mottled, very firm very cherty clay in the lower part. Escarpments, breaks, and some lower side slopes have gradient of more than 14 percent. Parts of some areas are stony.

Typically, the surface layer of the Nixa soil is very dark grayish brown cherty silt loam about 4 inches thick. The subsurface layer is grayish brown very cherty silt loam about 4 inches thick. The subsoil above the fragipan is yellowish brown, friable very cherty silt loam about 11 inches thick. The next layer, immediately above the fragipan, is brown, friable very cherty silt loam 3 inches thick. The fragipan is reddish brown and yellowish brown, mottled, firm very cherty silty clay loam about 15 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red and dusky red, mottled, very firm very cherty clay. In a few areas, slope is less than 5 percent. Some areas are stony, and a few areas have bedrock at a depth of less than 60 inches and have more clay in the lower part of the subsoil than typical.

Included with these soils in mapping and making up 5 to 10 percent of mapped areas are Goss and Viraton soils and Rock outcrop. The Goss soils have more clay than the major soils and are on the tops of ridges. The Viraton soils have more silt and less chert in the upper part of the subsoil and are on the top and upper side slopes of ridges. Rock outcrop is on the slope breaks.

Permeability is moderately rapid in the Clarksville soils and very slow in the Nixa soils. The available water capacity is low, and runoff is medium in both soils. A fragipan is at a depth of 12 to 24 inches in the Nixa soils. The fragipan limits the root zone. The response to soil amendments in the Clarksville soils is good but is only fair in the Nixa soils.

Many areas of these soils are in white oak and black oak woodland. Most cleared areas are in tall fescue and legume pasture. These soils are generally not suited to cultivation. Small grain and sorghum can be grown on some moderately sloping areas in rotations that include several years of pasture or hay crops if carefully managed and erosion is controlled. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain organic matter content, provide good tilth, and increase available water. Grass waterways, minimum tillage, farming on the contour, and occasional diversion or field terraces help to control erosion and retard runoff.

These Clarksville and Nixa soils are suited to grasses and legumes. Hay and pasture crops effectively control erosion. Tillage operations should be restricted to stand establishment, renovation, or reseeding. New stands should be seeded early enough to insure good ground cover. Nurse crops of small grain provide cover in fall and winter for late seedings. Overgrazing pasture reduces forage yield and increases the growth of weeds. Pasture quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and the timely deferment of grazing. Clipping pasture in June and August and the use of chemical sprays help to control weed and brush growth.

Trees are suited to these soils, and good stands of native hardwoods are in many areas. Equipment limitation and seedling mortality are moderate on both soils, and windthrow hazard is moderate on Nixa soils. These cherty soils have moderate limitations for tree planting equipment. Hand planting of seedlings is necessary in places. Planting special stock of larger size than normal or planting containerized stock helps to achieve better survival. Lighter, less intensive, more frequent thinnings reduce stand density and, consequently, windthrow damage. Fire protection and controlled grazing are included in good management.

The soils in this unit are suited to building site development and to some onsite waste disposal systems. The moderately sloping areas of Clarksville soils have only slight limitations for septic tank absorption fields. In strongly sloping areas, absorption fields can be designed to fit the slope or the site can be graded to modify the slope. Slope in Nixa soils and very slow permeability in the fragipan need to be considered in the design of waste disposal systems. Sewage lagoons function well if the slope is modified by grading, and the lagoon is properly designed. However, community sewers should be used if available. Frost action in Clarksville soils is a moderate limitation to local roads and streets. Properly constructed side ditches and culverts help remove excess water and prevent damage from frost action.

These Clarksville and Nixa soils are in capability subclass VIs and woodland suitability subclass 4f.

40E—Alsup very stony silt loam, 9 to 25 percent slopes. This deep, strongly sloping to steep, moderately well drained soil is on side slopes, foot slopes, and points of ridges on uplands. Individual areas are long, narrow, and range from about 20 acres to 100 acres or more. Colluvial siltstones 15 to 30 inches long, 8 to 20 inches wide, and 6 to 12 inches thick are spaced at intervals of about 5 to 30 feet on the surface of most slopes (*10*).

Typically, the surface layer is very dark grayish brown very stony silt loam about 4 inches thick. The subsurface layer is light brownish gray silt loam about 4 inches thick. The subsoil is about 26 inches thick. The upper part is yellowish brown, mottled, friable silty clay loam; the middle part is yellowish red and reddish brown, mottled, firm silty clay loam; and the lower part is multicolored, firm silty clay. The substratum to a depth of 48 inches is light gray, mottled silty clay loam. Pale olive, weathered silty shale is at a depth of 48 inches. In places, the surface layer is flaggy silt loam or very stony, stony, or flaggy loam. In places, slope is less than 9 percent.

Included with this soil in mapping and making up as much as 10 percent of mapped areas are stony, shallow soils that have shale and siltstone outcrops; making up 5 percent are Goss soils. The shallow, stony soils and Rock outcrop are steep, somewhat broken, and at a high elevation. The Goss soils are cherty and adjacent to the upper boundary of the mapped areas.

In this Alsup soil, permeability is moderately slow, runoff is rapid, and available water capacity is moderate. A water table is at a depth of 2.5 to 4 feet from December to March in most years. The shrink-swell potential is high below a depth of 30 to 40 inches. The response to soil amendments is good.

Most areas of this soil are in woodland. Most cleared areas are used for pasture. This soil is suited to trees, and good stands of native hardwoods are in many areas. Equipment limitation is severe; steep slopes are a safety hazard, and stones are a limitation for tree planting. The erosion hazard and seedling mortality are moderate. Roads and skid trails should be on the contour. Severe limitations in places require the yarding of logs uphill to logging roads or skid trails. Hand planting of seedlings is necessary in areas. Special erosion control measures require careful design and construction of roads and skid trails to minimize the steepness and length of slope and concentration of water. Seeding disturbed areas may be necessary after harvesting is completed. Planting special stock of a larger size than normal or planting containerized stock helps achieve better survival.

This soil is suited to grasses and legumes for pasture. Grasses and legumes grown for pasture effectively help control erosion. Overgrazing reduces the forage yield and increases the growth of weeds and brush. Grazing pasture when the soil is too wet causes surface compaction, poor tilth, and excess runoff. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture

rotation, and timely deferment of grazing. Chemical sprays help control broad-leaved weeds and brush.

This soil is suited to building site development. Factors to consider in design are high shrink-swell potential and slope. Slope and large stones are severe limitations for sewage lagoons. Suitable sewage lagoons can be located, designed, and constructed in adjoining nonstony, gently sloping and moderately sloping areas of Alsup soils. Sewerlines should be connected to community sewers if available. The proper design and construction of foundations, footings, and basement walls with adequate reinforcement help to prevent structural damage caused by shrinking and swelling. Drainage tile around foundations and footings of buildings provides drainage and prevents excessive wetness. Local roads and streets should have suitable base material to overcome low strength in this soil and should have side ditches and culverts to insure drainage and prevent damage caused by shrinking and swelling. Large stones need to be removed from the surface.

This Alsup soil is in capability subclass VIIs and woodland capability subclass 4x.

43D—Goss cherty silt loam, 5 to 14 percent slopes. This deep, moderately sloping and strongly sloping, well drained soil is on convex side slopes and the tops of ridges (fig. 16). Individual areas range from about 10 acres to 100 acres or more. A few to many sinkholes are in some areas.

Typically, the surface layer is dark grayish brown cherty silt loam about 8 inches thick. The subsoil to a depth of about 72 inches is yellowish red, friable and firm cherty silty clay loam in the upper part; red, firm cherty silty clay in the middle part; and dark red, mottled, very firm, cherty clay in the lower part. In some places, the surface layer is dark brown and more than 6 inches thick. In places, the average clay content in the upper part of the subsoil is less than 35 percent. Side slopes near the low perimeter of some areas, especially the side slopes of individual sinkholes, have scarped edges and slope of more than 14 percent. In places, limestone bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping and making up as much as 10 percent of mapped areas are Wilderness soils; making up 5 percent are Peridge, Viraton, and Gasconade soils and stony areas and Rock outcrop. The Wilderness soils are on the tops of ridges and have a fragipan. The gently sloping Peridge and Viraton soils are on tops, foot slopes, and in slight depressions of ridges and do not have a cherty surface layer. Also, Viraton soils have a fragipan. The shallow Gasconade soils and areas of Rock outcrop are on the breaks.

This Goss soil is moderately permeable. Runoff is rapid, and available water capacity is low. The shrink-swell potential is moderate. The response to soil amendments is good.

Most areas of this soil are in pastureland, hayland, and woodland. This soil is suited to grasses, alfalfa or other legumes, and small grain as forage and grain crops. The moderately sloping areas are suited to soybeans, sorghums, or corn if erosion is controlled. Erosion can be controlled by growing row crops in rotations that include several years of pasture or hay crops. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain the organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and contour cultivation help to control erosion and retard runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Tillage operations should be restricted to stand establishment, renovation, or reseeding. New stands need to be seeded early enough to insure good ground cover. Nurse crops of small grain provide cover for seedings late in fall. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing. Weedy areas should be clipped in June and August. Chemical sprays help to control broad-leaved weeds.

This soil is suited to trees, and stands of native hardwoods are in many areas. The growth rate is fair to

Figure 16.—A roadside cut showing the profile of Goss cherty silt loam, 5 to 14 percent slopes, in an area of woodland.

good. The cherty soil is a moderate limitation for tree planting equipment. Planting seedlings by hand is necessary in places. Fire protection and controlled grazing are included in good management.

This soil is suited to building site development and to some onsite waste disposal systems. Factors to consider in design are slope, moderate shrink-swell potential, moderate permeability, low strength, and stones on the surface. Septic tank absorption fields should be enlarged to compensate for the moderate permeability. Sites for sewage lagoons need to be graded to modify the slope, and the bottoms of lagoons need to be sealed to prevent seepage. Community sewers should be used if available. Structural damage to basement walls and foundations of buildings because of moderate shrinking and swelling can be prevented by proper design and adequate reinforcement. Suitable base material is needed for local roads and streets to overcome the low strength, also, side ditches and culverts remove excess water, insure proper drainage, and prevent damage from frost action. Some cuts and fills may be necessary because of slope. Embankments for farm ponds and sewage lagoons are very difficult to pack and seal. Because the underlying limestone is thin, porous, and transmits water freely, farm ponds must be properly constructed to insure that water will be retained (*12*). Porosity and permeability of this soil can be reduced by use of compaction equipment, artificial sealants, and deflocculating agents.

This Goss soil is in capability subclass VIs and woodland suitability subclass 4f.

44E—Goss-Gasconade complex, 2 to 50 percent slopes. This complex consists of deep, gently sloping to steep, well drained Goss soils and shallow, gently sloping to steep, somewhat excessively drained Gasconade soils. These soils are on the tops and sides of upland ridges and rock-scarped bluffs adjacent to stream flood plains and terraces. The extent of Goss and Gasconade soils varies from area to area, but generally the average is about 60 percent Goss soils and 15 percent Gasconade soils. Individual areas range from about 5 acres to 500 acres or more. Except for a few especially large units in the northeastern corner of Greene County, areas are elongated and narrow or isolated and relatively small. In many places, flagstones and stones of chert and limestone are on the surface.

Typically, the surface layer of the Goss soil in this unit is brown cherty silt loam about 4 inches thick. The subsoil to a depth of about 60 inches is yellowish red, firm cherty silty clay loam in the upper part; dark red, very firm cherty silty clay in the middle part; and dark red, very firm cherty clay in the lower part. In places, the surface layer is dark brown and 6 to 10 inches thick.

Typically, the surface layer of the Gasconade soil in this unit is dark brown and very dark grayish brown stony silty clay loam about 11 inches thick. Hard limestone bedrock is at a depth of 11 inches.

Included with this complex in mapping and making up 5 to 10 percent of mapped areas are Wilderness and Viraton soils; making up 5 percent are Peridge, Pembroke, and Sampsel soils and Rock outcrop. The Viraton and Wilderness soils have a fragipan and are on the tops and upper sides of ridges. The Peridge and Pembroke soils contain less coarse fragments than the major soils and are on narrow terraces, low upland side slopes, and ridgetops. The Sampsel soils contain less coarse fragments and are on gentle slopes adjacent to Gasconade soils at a low elevation. Areas of Rock outcrop are on the bluffs or other breaks in the landscape.

The Goss soils are moderately permeable, surface runoff is rapid, and available water capacity is low. Permeability in the Gasconade soils is moderately slow, runoff is rapid, and available water capacity is very low. Shrink-swell potential is moderate in both soils. Response to soil amendments is good in Goss soils and poor in Gasconade soils.

Many areas of these soils are in black oak and post oak woodland with isolated glades of native grasses, pricklypear cactus, and some redcedar. Most cleared areas are in pastureland consisting of tall fescue, native grasses, and legumes. These soils are suited to grasses and legumes. Overgrazing pasture reduces the forage yield and increases the growth of weeds. Chemical sprays help to control weeds and brush. Good plant cover helps to control erosion, maintain organic matter content, and increase available water. Forage quality and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and the timely deferment of grazing.

Many areas of these soils are suited to trees. Many areas of the Goss soils have good stands of native hardwoods. Low production on the Gasconade soils generally does not warrant intensive timber management. Goss soils have a moderate erosion hazard and severe equipment limitation and seedling mortality. Special erosion control measures require careful design and construction of roads and skid trails to minimize the steepness and length of slope and the concentration of water. Seeding disturbed areas may be necessary after harvesting is completed. Steep slopes are a safety hazard for equipment. Severe limitations in places require the yarding of logs uphill to logging roads or skid trails. Hand planting of seedlings of larger size than normal or planting containerized stock increases the chance of seedling survival. Fire protection and controlled grazing are included in good management.

The Goss and Gasconade soils in this unit are suited to the development of habitat for woodland and openland wildlife. Adequate cover is produced, but forage for wildlife, especially seed grain plants, is scarce. Timely plantings of grain sorghums, legumes, grasses, shrubs, and trees on cleared nonstony Goss soils and in the included areas of Peridge and Pembroke soils increase production and improve the quality of food and

cover. A good place to plant is at the edge of the woodland, other fringe areas, or on adjacent soils that are better suited. Wildlife areas should be protected from grazing and fire.

These soils generally are not suited to building site development and onsite waste disposal, except for the gently sloping to strongly sloping areas of Goss soils. The use of this unit is limited because a large part of most areas is moderately steep or steep and has stones and smaller coarse fragments of chert and limestone on the surface, and the Gasconade soils are shallow to limestone bedrock. Onsite investigation is needed to locate suitable sites for building development.

These Goss and Gasconade soils are in capability subclass VIIs. Woodland capability subclass is 5d for the Gasconade soils and 4f for the Goss soils.

45E—Clarksville cherty silt loam, 14 to 30 percent slopes. This deep, moderately steep and steep, somewhat excessively drained soil is on the sides and terminal points of ridges on uplands. Individual areas are long and narrow and range from about 10 acres to several hundred acres. Adjacent to the larger stream bottoms, especially Spring River and its major tributaries, limestone bedrock escarpments mark the lower boundary of many areas.

Typically, the surface layer is very dark grayish brown and dark brown cherty silt loam about 4 inches thick. The subsurface layer is brown cherty silt loam about 12 inches thick. The subsoil to a depth of about 72 inches is brown, friable very cherty silty clay loam in the upper part; yellowish red and red, firm very cherty silty clay loam in the middle part; and dark red, very firm very cherty clay in the lower part. Several small areas are stony. Also, small areas on some ridgetops have slope of less than 14 percent. Bedrock is at a depth of 40 to 60 inches in a few areas. Escarpments and sides of some ridges have slope of more than 30 percent.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Nixa and Wilderness soils; making up 5 percent are Gasconade and Goss soils and Rock outcrop. The Nixa and Wilderness soils are on the tops, points, and upper side slopes of ridges and have a fragipan. The Goss soils are on the nose and low side slopes of ridges and have more clay in the upper part of the subsoil than this Clarksville soil. The shallow Gasconade soils and areas of Rock outcrop are on the landscape breaks.

Permeability in this Clarksville soil is moderately rapid, runoff is rapid, and available water capacity is low. Response to soil amendments is good.

Most areas of this soil are in white oak and black oak woodland. Most cleared areas are used for pasture or hay. Pasture is mainly tall fescue, native grasses, and legumes. This soil is suited to grasses and legumes. Tillage operations should be restricted to stand establishment, renovation, or reseeding. A crawler type tractor and heavy disk may be needed for tilling the steeper slopes. New stands should be seeded early enough in the season to insure good ground cover. Broadcasted nurse crops of small grain provide cover in fall and winter for late seedings. Overgrazing pasture reduces forage yield and increases the growth of weeds. Pasture quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing. Mowing and chemical sprays help to control brush and broad-leaved weeds.

This Clarksville soil is suited to trees. Stands of native hardwoods are in many areas, and good stands of white oak and black oak, especially, are on some north- and east-facing slopes. Seedling mortality and equipment limitations because of the steep slopes and chert content are moderate concerns of management. Planting special stock of larger size than normal or planting containerized stock increases the seedling survival rate. Cherty soils have moderate limitations for tree planting equipment. The hand planting of seedlings is necessary in places. Steep slopes indicate a safety hazard for equipment. Roads and skid trails should be on the contour. Severe limitations in places require the yarding of logs uphill to logging roads or skid trails. Fire protection and controlled grazing are included in good management.

This soil is generally not suited to building site development and most sanitary facilities. Steep slopes and seepage are severe limitations that are not easily overcome.

This Clarksville soil is in capability subclass VIIs and woodland suitability subclass 4f.

50C—Nixa cherty silt loam, 2 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on the tops and side slopes of ridges on uplands. Individual areas range from about 20 acres to several hundred acres. The size and shape of areas are convenient for farm operations.

Typically, the surface layer is very dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is grayish brown cherty silt loam about 4 inches thick. The subsoil above the fragipan is yellowish brown, friable very cherty silt loam about 12 inches thick. The fragipan is about 23 inches thick. The upper part is strong brown, mottled, firm very cherty silt loam, and the lower part is mottled, multicolored, very firm very cherty silty clay loam. The subsoil below the fragipan to a depth of 72 inches is dark reddish brown and dark red, very firm cherty clay. Small areas adjacent to the lower perimeter of some areas have slope of more than 9 percent, and some of these have scarped edges. Also, a small part of some areas is stony.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Clarksville and Viraton soils. The Clarksville soils are on steeper side slopes and narrow points of ridges and do not have a fragipan. The Viraton soils are on the wider tops and points of

ridges at the higher elevations, and they have less chert above the fragipan than this Nixa soil.

This Nixa soil is very permeable, runoff is medium, and available water capacity is low. A fragipan at a depth of 14 to 24 inches limits the root zone. Response to soil amendments is fair.

Most areas of this soil are in oak woodland and fescue pastureland. This soil is suited to small grain and to sorghum or other row crops if erosion is controlled. Erosion can be controlled by including several years of pasture or hay crops in rotation with the row crops. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to maintain organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and farming on the contour help to control erosion and retard runoff.

This soil is suited to grass and legume pasture and hay crops. These crops effectively control erosion. Tillage operations should be restricted to stand establishment, renovation, or reseeding. New stands need to be seeded early to insure good ground cover before the end of the growing season. Nurse crops of small grain provide cover late in fall and winter before seedlings are established. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and forage production are improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This soil is suited to trees, and stands of native hardwoods are in many areas. Seedling mortality and windthrow hazard are moderate. Planting special stock of larger size than normal or planting containerized stock increases the survival rate of seedlings. Decreasing stand density by lighter, less intensive, more frequent thinnings helps to reduce the windthrow hazard. Fire protection and controlled grazing are included in good management.

This soil is suited to building site development and to sewage lagoons if they are properly designed and constructed. The main limitations are very slow permeability, slope, and the abundance of chert. Sewage lagoons function if the site is graded to modify the slope. Increasing the thickness of the soil material above the fragipan by properly constructing a mound increases the size of the absorption field. This procedure helps to make the soil suitable for septic tanks; however, community sewers should be used if available. Slope is a moderate limitation for local roads, but slopes can be modified by cutting, filling, and grading.

This Nixa soil is in capability subclass IVs and woodland suitability subclass 4f.

53B—Wilderness and Goss cherty silt loams, 2 to 5 percent slopes. This map unit consists of deep, gently sloping, moderately well drained Wilderness soils and well drained Goss soils on the convex tops and sides of ridges on uplands. Wilderness soils at the higher elevations have dominant slopes of 2 or 3 percent; Goss soils have dominant slopes of 4 or 5 percent. The extent of Wilderness soils and Goss soils in individual areas varies from area to area. In some areas, only one of these soils is present. On the average, areas are about 40 percent Wilderness soils and 25 percent Goss soils. Individual areas are irregular in shape and range from about 10 acres to 100 acres or more. A few to numerous sinkholes are in most areas. Some areas have a few stones on the surface.

Typically, the Wilderness soil has a surface layer of very dark grayish brown cherty silt loam about 5 inches thick. The subsurface layer is brown and grayish brown very cherty silt loam about 11 inches thick. The subsoil above the fragipan is brown, friable very cherty silty clay loam about 8 inches thick. The fragipan is multicolored, firm very cherty silty clay loam about 10 inches thick. The subsoil below the fragipan is dark red, very firm cherty clay to a depth of 64 inches. In places, the fragipan is intermittent or weakly developed. In places, slopes are more than 5 percent.

Typically, the Goss soil has a surface layer of dark grayish brown cherty silt loam about 8 inches thick. The subsoil to a depth of about 60 inches is brown, friable cherty silty clay loam in the upper part; yellowish red, firm cherty silty clay loam in the middle part; and dark red, very firm cherty clay in the lower part. In places, the surface layer is dark brown and more than 7 inches thick. In places, the clay content in the upper part of the subsoil averages less than 35 percent. In a few areas on hilltop knolls and low side slopes, bedrock is at a depth of 50 to 60 inches. The sides of some sinkholes have scarped rock edges or slopes of more than 5 percent.

Included with these soils in mapping and making up as much as 15 percent of mapped areas are Peridge, Viraton, and Gasconade soils and small areas of Rock outcrop. The Peridge soils have less chert and clay in the upper part of the subsoil than Goss soils, and they have less chert than Wilderness soils. Peridge soils are adjacent to drainageways, in slight depressions on ridgetops, and on foot slopes. The shallow Gasconade soils and Rock outcrop are on slope breaks. The Viraton soils have a fragipan and a silt loam surface layer and are on tops of broad ridges.

The Wilderness soils are moderately permeable above the fragipan and slow in the fragipan. Goss soils are moderately permeable. Runoff is medium on both soils, and the available water capacity is low. Wilderness soils have a perched water table at a depth of 1.5 to 2.0 feet from December through March in most years, and the root zone is limited by the fragipan at a depth of 15 to 29 inches. The shrink-swell potential of both soils is moderate below a depth of 19 to 38 inches. The response to soil amendments is fair for Wilderness soils and good for Goss soils.

Most areas of these soils are in pastureland, hayland, or woodland. Some areas are in cropland.

These soils are suited to grasses, alfalfa or other legumes, and small grain for forage and grain crops. If erosion is controlled, these soils are also suited to soybeans, sorghum, or corn. Growing row crops in a rotation that includes several years of pasture or hay crops helps to control erosion. The proper use of crop residue, cover crops, and green manure crops helps to maintain the organic matter content, maintain good tilth, and increase the available water capacity. Terraces, grassed waterways, minimum tillage, and contour cultivation help to control erosion and retard runoff.

Growing grasses and legumes for hay and pasture effectively helps to control erosion. Tillage operations should be restricted to stand establishment, renovation, and reseeding. Seeding new stands early insures good ground cover. Nurse crops of small grain provide cover for seedings late in fall. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Pasture quality, soil condition, and forage production are improved by proper fertilization, stocking rates, and pasture rotation and by timely deferment of grazing. Weedy areas should be clipped in June and August. Chemical sprays help to control broad-leaved weeds.

These soils are suited to trees. Many areas have a stand of native hardwoods. Chert is a moderate limitation for use of equipment on Goss soils. In places, seedlings need to be planted by hand. Seedling mortality and windthrow hazard are moderate management concerns on Wilderness soils. In places, special planting stock of larger size than usual or containerized stock helps to achieve better survival rates. Lighter, less intensive, and more frequent thinnings to reduce stand density can minimize windthrow damage. Fire protection and controlled grazing are good management practices.

These soils are suited to building site development and some onsite waste disposal. Factors to consider in design are wetness, restricted permeability in the Wilderness soils, moderate shrinking and swelling in the Goss subsoil, low strength, and frost action potential. Sewage lagoons function if they are properly designed and the area is graded to modify the slope. Increasing the thickness of the soil above the fragipan in a properly constructed mound makes these soils acceptable as septic tank absorption fields (*3*). However, community sewers should be used if available. Properly designing basement walls and foundations for buildings and constructing them with adequate reinforcement help to prevent structural damage caused by the moderate shrinking and swelling of the soil.

Suitable base material for local roads and streets is needed to overcome the low strength of these soils. Proper drainage by side ditches and culverts lowers the water table on Wilderness soils and helps to prevent damage caused by wetness and frost action.

Because the limestone residuum under the soils in this map unit is thin and porous and transmits water freely, farm ponds need to be properly constructed to ensure the retention of water (*12*). Porosity and permeability of the soils can be reduced by compaction equipment, artificial sealants, and deflocculating agents.

These soils are in capability subclass IVs. The Wilderness soils are in woodland suitability subclass 4d, and the Goss soils are in woodland suitability subclass 4f.

54—Lanton silt loam. This deep, nearly level, somewhat poorly drained soil is on broad flood plains, along narrow drainageways, and in depressions. Slope is less than 2 percent. Flooding is frequent. Individual areas range from less than 10 acres to 100 acres or more.

Typically, the surface soil is about 29 inches thick. It is very dark gray silt loam in the upper part, very dark gray silty clay loam in the middle part, and very dark gray, mottled silty clay loam in the lower part. The substratum to a depth of about 63 inches is dark gray and grayish brown, mottled, firm silty clay loam in the upper part and gray, strong brown, and dark gray silty clay loam in the lower part. In places, the lower part of the substratum is gravelly.

Included with this soil in mapping and making up 5 to 15 percent of mapped areas are Hepler soils; making up as much as 5 percent are Huntington soils. Small areas of Cedargap and Osage soils are also included. The Hepler soils on low terraces and well drained Huntington soils near stream channels have a thinner, dark colored surface layer than this Lanton soil. The Cedargap soils have more coarse fragments in the 10- to 40-inch zone and are on flood plains of small streams. The Osage soils have more clay and are on low areas of large flood plains.

Permeability of this Lanton soil is moderately slow, surface runoff is slow, and available water capacity is high. An apparent water table is at a depth of 1 foot to 2 feet from December to May in most years. The response to soil amendments is good if surface drainage is adequate.

Most areas of this soil are in cultivated cropland, pastureland, or hayland. The extent of cropland is about the same as the combined acreage of pastureland and hayland. A small acreage is in woodland. This soil is suited to summer annuals, such as corn or soybeans, and to water-tolerant grasses and legumes, such as tall fescue or reed canarygrass and alsike or Ladino clover. It is also suited to small grain. Frequent flooding from January to May is a major concern of management. Land smoothing, surface ditches, and tile help to improve drainage. Supplemental irrigation is feasible, but available water supplies are limited.

This soil is suited to grasses and legumes grown for pasture or hay. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and increases the growth of weeds. Pasture quality, soil condition, and forage yield can be improved by proper stocking rates, fertilization, pasture rotation, timely

deferment of grazing, and restricting use during wet periods.

This soil is suited to trees that tolerate wet soils that have high available water capacity. Equipment limitation, seedling mortality, and plant competition are severe. Equipment operations should take place during periods in which the soil is dry or frozen. Ridging the soil and planting on the ridges increase seedling survival. Plant competition for seedlings can be reduced by careful site preparation, including prescribed burning, spraying, and cutting.

This soil is generally not suited to building sites, sanitary facilities, camp areas, and playgrounds because of frequent flooding. If dwellings or small buildings are constructed, protection from flooding is necessary, and special design is needed.

This Lanton soil is in capability subclass IIw and woodland suitability subclass 2w.

55—Huntington silt loam. This deep, nearly level, well drained soil is on flood plains. Slope ranges from 0 to 2 percent. This soil is occasionally flooded. Individual areas are less than 10 acres to 500 acres or more. Some small areas are dissected by stream channels and have limited access.

Typically, the surface soil is very dark grayish brown silt loam about 12 inches thick. The subsoil is brown, friable silt loam about 36 inches thick. The substratum to a depth of 60 inches is brown and dark brown, mottled silt loam. In places, the dark colored surface soil is more than 24 inches thick or less than 10 inches thick; the surface soil is lighter colored than in this typical profile; or the lower part of the substratum is gravelly.

Included with this soil in mapping and making up as much as 15 percent of mapped areas are Cedargap, Hepler, Lanton, and Secesh soils. The Cedargap soils have more chert than this Huntington soil and are on flood plains of small streams. The Hepler soils are somewhat poorly drained and are on low terraces and along upland drainageways; Lanton soils are poorly drained and are along drainageways and depressions; and Secesh soils have more chert and are on terraces at a higher elevation.

This Huntington soil is moderately permeable, surface runoff is medium, and available water capacity is very high. An apparent water table is at a depth of 4 to 6 feet from December to April in most years. The response to soil amendments is very good.

Most areas of this soil are in cropland. Some areas are in pastureland or hayland. A few isolated and limited access areas are in woodland. This soil is suited to corn, sorghums, small grain, alfalfa, and soybeans. Occasional flooding from December to May is a major concern of management. The proper use of crop residue, green manure crops, and minimum tillage help to maintain organic matter content and tilth and increase available water. Diversion terraces protect areas of this soil from runoff from adjacent uplands. Supplemental irrigation is feasible, but available adequate water supplies are limited. Grading and smoothing of the surface improves drainage in places.

Overgrazing pasture increases the growth of weeds and reduces yields. Grazing when the soil is wet causes surface compaction, poor tilth, and excessive runoff. Pasture quality, forage production, and soil condition can be improved by proper stocking rates, fertilization, pasture rotation, timely deferment of grazing, and restricting use during wet periods.

This soil is suited to trees. The removal of undesirable trees increases the value of existing stands of hardwoods. Except for competition from noncommercial species, concerns of management are slight.

This soil is generally not suited to building site development or onsite waste disposal because of occasional flooding.

This Huntington soil is in capability subclass IIw and woodland capability subclass 1o.

56—Osage silty clay loam. This deep, nearly level, poorly drained soil is mainly on wide flood plains of major streams adjacent to upland foot slopes and side slopes. A few relatively small areas are on narrow flood plains of intermittent streams. Slope is less than 2 percent. Flooding is occasional. Individual areas are few and range from about 10 acres to several hundred acres.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is very dark gray silty clay loam about 5 inches thick. The subsoil to a depth of about 68 inches is very dark gray, mottled, very firm silty clay in the upper part; dark gray and gray, mottled, very firm silty clay in the middle part; and mottled light gray, gray, and dark gray, very firm silty clay in the lower part. In places, the surface layer is silty clay, and in places, the lower part of the subsoil is gravelly.

Included with this soil in mapping and making up as much as 10 percent of mapped areas are Lanton soils; making up about 5 percent are Huntington soils. A few small areas of Sampsel soils are also included. The well drained Huntington soils have less clay than this Osage soil and are adjacent to meandering stream channels. The somewhat poorly drained Lanton soils have less clay and are on positions similar to those of this Osage soil. The Sampsel soils are gently sloping and on low foot slopes.

This Osage soil is very slowly permeable, surface runoff is slow or very slow, and available water capacity is moderate. An apparent water table is at the surface to a depth of 1 foot most of the time from November to May in most years. Shrink-swell potential is high in the surface soil and very high in the subsoil. The response to soil amendments is good if surface drainage is adequate.

Most areas of this soil are in cultivated cropland. A small acreage is in pastureland or hayland. This soil is suited to cultivated row crops. If it is used for cropland,

wetness and occasional, brief to long duration flooding from November to May in most years are major management concerns. Land smoothing and properly designed and constructed surface ditches improve the surface drainage. Crop residue utilization, tilling the soil under optimum moisture conditions, and deep plowing in fall improve tilth and the chances of early planting in spring. Supplemental irrigation is feasible, but available adequate water supplies are limited.

Wetness and seasonal flooding are concerns of management if this soil is used for pastureland or hayland. Shallow surface ditches and land smoothing help to improve drainage. Grazing when the soil is wet or overgrazing causes surface compaction and poor tilth, reduces the stand of grasses and legumes, and increases the growth of weeds. The pasture and soil can be maintained in good condition and yields improved by proper stocking rates, fertilization, pasture rotation, timely deferment of grazing, and restricted use during wet periods.

This soil is suited to trees. Equipment limitation, seedling mortality, and windthrow hazard are moderate. Equipment operations should take place during periods in which the soil is dry or frozen. Ridging the soil and planting on the ridges help to increase seedling survival. Lighter, less intensive, more frequent thinning of stands reduces windthrow damage. Severe plant competition for seedlings can be reduced by careful site preparation, including prescribed burning, spraying, or cutting. Release treatments may be necessary to ensure development.

This soil is generally not suited to building site development, sanitary facilities, and recreation development because of occasional flooding.

This Osage soil is in capability subclass IIIw and woodland suitability subclass 4w.

61B—Hoberg silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on the tops, sides, and foot slopes of ridges on uplands and terraces. Individual areas range from about 20 acres to 300 acres or more.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil above the fragipan is dark brown and reddish brown, friable silty clay loam about 15 inches thick (fig. 17). The fragipan is mottled reddish brown, light brown, and pinkish gray, firm very cherty silty clay loam about 15 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red and dark reddish brown, mottled, very firm very cherty clay. Small eroded areas or spots on the breaks of some side slopes have a dark colored surface layer less than 6 inches thick. In places, the subsoil above the fragipan contains more than 35 percent clay.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Keeno soils; making up as much as 5 percent are Pembroke and Eldon soils. The Eldon and Keeno soils have more chert in the surface layer and the upper part of the subsoil than this Hoberg soil and are on knolls and breaks. The Pembroke soils do not have chert or a fragipan and are in positions similar to those of Hoberg soils.

This Hoberg soil is moderately permeable above the fragipan and slow in the fragipan. Runoff is medium, and the available water capacity is low or moderate. A

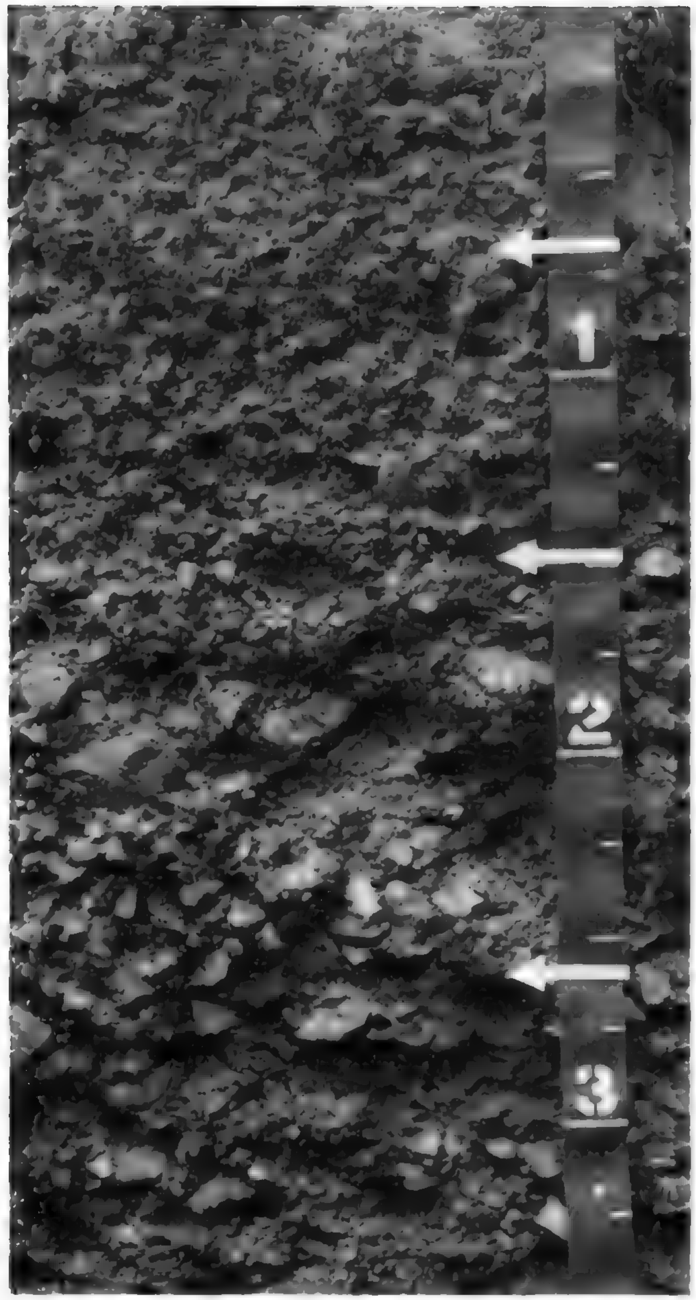

Figure 17.—Profile of Hoberg silt loam, 2 to 5 percent slopes. Note the dark surface soil and the fine chert in the subsoil above the fragipan. Depths are shown in feet. Photo courtesy of C. L. Scrivner, University of Missouri Agricultural Experiment Station.

perched water table is at a depth of 1.5 to 3 feet from December through March in most years. The root zone is limited by a fragipan at a depth of 16 to 36 inches. The response to soil amendments is good.

Most areas of this soil are in pastureland or cropland. This soil is suited to small grain, grasses, legumes, soybeans, and sorghums for forage and grain. Moderate susceptibility to erosion and droughtiness in summer are major concerns of management. Erosion can be controlled by including several years of hay and pasture in the cropping system with row crops. The proper use of crop residue, cover crops, and green manure crops helps to maintain the organic matter content, insure good tilth, and increase available water. Terraces, grassed waterways, and minimum tillage help to control erosion.

Grasses and legumes grown for hay and pasture effectively control erosion. Overgrazing pasture reduces the yield of grasses and legumes and increases the growth of weeds. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This soil is suited to trees. Windthrow hazard and seedling mortality are moderate. Reducing the stand by lighter, less intensive, more frequent thinnings is needed to help reduce windthrow damage. Planting special stock of larger size than normal or planting containerized stock helps to achieve better seedling survival.

This soil is suited to building site development and to some onsite waste disposal systems. Factors to consider in design are seasonal wetness and slow permeability caused by the fragipan at a depth of 16 to 36 inches. Sewerlines should be connected to community sewers if available or to suitable sewage lagoons. Waterproofing the outside of foundations and basement walls of buildings and draining with tile help to prevent damage from excessive wetness. Proper drainage of local roads and streets by side ditches and culverts lowers the water table and helps to prevent damage from wetness and frost action.

This Hoberg soil is in capability subclass IIe and woodland suitability subclass 4d.

76—Hepler silt loam. This deep, nearly level, somewhat poorly drained soil is on broad, low stream terraces, along narrow upland drainageways, and in sinkholes in depressions and drainageways. Slope ranges from 0 to 2 percent. Flooding is occasional. Individual areas range from about 5 acres to 100 acres or more. They are mainly elongated, wide, and well suited to farming.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 12 inches thick. The subsoil to a depth of about 65 inches is grayish brown, mottled, friable silt loam in the upper part; grayish brown, mottled, firm silty clay loam in the middle part; and mottled, multicolored, firm silty clay loam in the lower part.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are Lanton, Huntington, and Secesh soils. Also included are a few small areas of Carytown soils. The Lanton soils and well drained Huntington soils have a thicker, dark colored surface layer than this Hepler soil and are on flood plains. The well drained Secesh soils have more chert and are on low terraces and high flood plains. The poorly drained Carytown soils have a lighter colored or thinner, dark colored surface layer and a clayey subsoil and are on low terraces or upland foot slopes.

Permeability in this Hepler soil is moderately slow, surface runoff is slow, and available water capacity is high. An apparent water table is at a depth of 1 foot to 3 feet from November to March in most years. The response to soil amendments is good if surface drainage is adequate.

Most areas of this soil are in cropland and pastureland. A few areas are in woodland. This soil is suited to summer annuals, such as soybeans or corn, or to water-tolerant perennial grasses and legumes, such as tall fescue and alsike clover. Wetness and occasional flooding for brief periods from March to July are major concerns of management if this soil is used for cropland. Land smoothing and shallow ditches improve surface drainage. The proper utilization of crop residue helps to maintain organic matter content, insure good tilth, and increase available water. Supplemental irrigation is desirable, but the availability of an adequate water supply is limited.

Areas of this soil, especially areas in small narrow upland drainageways, are better suited to grasses and legumes for pasture or hay than to most other crops. Grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing reduces the yield of grasses and legumes and increases the growth of weeds. Restricting use during wet periods, liming and fertilizing as needed, proper stocking rates, pasture rotation, and timely deferment of grazing improve pasture and soil conditions as well as the forage yield.

This Hepler soil is suited to trees that tolerate wet soils. Because the available water capacity is high, a good growth rate can be expected. Plant competition is moderate. Damage to seedlings can be reduced by careful and thorough site preparation, including prescribed burning, spraying, or cutting. Planting and harvesting operations should be done when the soil is firm.

This soil is generally not suited to building site development and onsite waste disposal because of occasional flooding. If dwellings or small buildings are constructed, protection from flooding is necessary and special design is needed.

This Hepler soil is in capability subclass IIw and woodland suitability subclass 3o.

81B—Viraton silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on the tops, sides, and foot slopes of ridges on uplands and terraces. Individual areas range from about 10 acres to several hundred acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil above the fragipan is about 15 inches thick (fig. 18). The upper part is yellowish brown and strong brown, friable silty clay loam, and the lower part is strong brown, mottled, firm silty clay loam. The fragipan is reddish brown and yellowish red, mottled, firm very cherty silty clay loam about 12 inches thick. The subsoil below the fragipan to a depth of 72 inches is dark red, mottled, very firm cherty clay. In some places the surface layer is dark brown or very dark grayish brown and more than 6 inches thick. Small eroded areas or spots on the breaks of some side slopes have a surface layer of brown silty clay loam.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are Goss, Wilderness, Needleye, and Peridge soils. The Goss and Wilderness soils are cherty throughout and are on knolls and breaks. The Needleye soils are grayer in the upper 10 inches of the subsoil than this Viraton soil and are near the heads of drains, in depressions, and on or near the crest of the wider ridgetops. The Peridge soils do not have a fragipan. They are on terraces and on positions similar to those of this Viraton soil.

This Viraton soil is moderately permeable above the fragipan and slow in the fragipan. Runoff is medium, and available water capacity is low or moderate. A perched water table is at a depth of 1.5 to 3 feet in most years. The root zone is limited by a fragipan at a depth of 16 to 36 inches. The response to soil amendments is good.

Most areas of this soil are in pastureland, cropland, and woodland. This soil is suited to small grain, grasses, legumes, soybeans, and sorghums for forage and grain. Row crops can be included in the crop rotation if erosion is controlled. The proper use of crop residue and including cover crops and green manure crops in the cropping system help to control erosion, maintain organic matter content, provide good tilth, and increase available water. Terraces, grassed waterways, minimum tillage, and farming on the contour control erosion and retard surface runoff.

Grasses and legumes grown for hay and pasture effectively control erosion. Overgrazing the pasture reduces the yield of grasses and legumes and increases the growth of weeds. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This soil is suited to trees, and stands of native hardwoods are in many areas. Windthrow hazard and seedling mortality are moderate management problems. Lighter, less intensive, more frequent thinnings to reduce stand density also reduce windthrow damage. Planting

Figure 18.—Profile of Viraton silt loam, 2 to 5 percent slopes. Note the light colored surface soil and the fine chert in the subsoil above the fragipan. Depths are shown in feet.

special stock of larger size than normal or planting containerized stock helps to achieve better seedling survival. Protection from fire and controlled grazing are included in management.

This soil is suited to building site development and to some onsite waste disposal systems. Factors to consider in design are seasonal wetness and slow permeability caused by the presence of a fragipan at a depth of 16 to 36 inches. Sewerlines should be connected to public sewers, if available, or to suitably located, designed, and constructed sewage lagoons. Increasing the thickness of soil material above the fragipan by properly constructing a mound of surface soil or other desirable material helps make this soil suitable for septic tank absorption fields (*3*). Damage from excessive wetness can be prevented by proper use of drainage tile in the design and construction of foundations, footings, and basement walls. Local roads and streets need suitable base material to overcome the low strength of this soil. Proper drainage by the use of side ditches and culverts lowers the water table and helps to prevent wetness.

This Viraton soil is in capability subclass IIe and woodland suitability subclass 4d.

83D—Gasconade-Rock outcrop complex, 2 to 20 percent slopes. This complex consists of horizontal, alternating bands of shallow, gently sloping to moderately steep, somewhat excessively drained Gasconade soils and limestone Rock outcrop. It is on the rough, broken side slopes and hilltop knolls of ridges on uplands (fig. 19). The extent of the Gasconade soils and Rock outcrop varies from area to area. Generally, the complex consists of about 60 percent Gasconade soils and 15 percent Rock outcrop. Individual areas range from 5 acres to several hundred acres. Some stones and smaller coarse fragments of limestone and chert are on the surface.

Typically, the surface layer of the Gasconade soil is very dark brown flaggy clay loam about 7 inches thick. The subsoil is dark brown, firm flaggy silty clay about 8 inches thick. Hard limestone bedrock that is fractured at irregular intervals is at a depth of 15 inches. In places, the surface layer and subsoil are reddish. The depth to bedrock limestone is 20 to 30 inches in places. Some small areas and parts of some large areas are stony.

The Rock outcrop consists of exposed limestone bedrock. Accumulations of as much as 3 inches of soil material similar to the surface layer of the Gasconade soils cover the bedrock in places.

Included with this complex in mapping and making up as much as 15 percent of mapped areas are Eldon,

Figure 19.—Grass, scrub oak, and redcedar in an area of Gasconade-Rock outcrop complex, 2 to 20 percent slopes.

Goss, and Sampsel soils. The deep, gently sloping to strongly sloping Eldon and Goss soils are on side slopes near the lower boundary of the mapped areas. The deep, gently sloping Sampsel soils are at the heads of drainageways or in depressions.

Permeability in the Gasconade soil is moderately slow, and runoff is rapid. Hard bedrock at a depth of less than 20 inches results in very low available water capacity and a shallow root zone. Shrink-swell potential is moderate. The response to soil amendments ranges from none to very poor.

Most areas of this complex are in native grasses and legume pastureland and isolated glades of woodland. This complex is suited to grasses for pasture. The use of ordinary farm machinery is impractical or impossible in most areas. Parts of some areas can be tilled, seeded, and mowed. Tall fescue gives fair production. Grasses and legumes grown for pasture or hay effectively control erosion. Overgrazing reduces the forage yield and increases the growth of weeds and brush. Pasture quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing.

This complex is generally not suited to trees; however, parts of many areas have a sparse population of redcedar and low quality oaks. Even though the timber is harvested for lumber and fence posts, production is low and timber is not generally managed for commercial uses.

Areas of this complex are generally not suited to building site development and onsite waste disposal. Major limitations are the shallow depth to bedrock, outcrops of rock, and stones and small coarse fragments of chert and limestone on the surface.

This complex is in capability subclass VIIs and woodland suitability subclass 5d.

94—Cedargap cherty silt loam. This deep, nearly level, somewhat excessively drained soil is on the flood plains of small streams. Slope ranges from 0 to 2 percent. Flooding is frequent. Individual areas are long, narrow, and dissected by stream channels. They range from about 10 acres to 100 acres or more.

Typically, the surface soil is very dark grayish brown and dark brown cherty silt loam about 18 inches thick. The substratum to a depth of 65 inches is dark brown very cherty silty clay loam over cherty silty clay loam. In places, the surface soil is silt loam. Also, in places, the combined thickness of the dark brown surface soil and the upper layer of the substratum is less than 24 inches.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Waben soils. The Waben soils are on low terraces, alluvial-colluvial fans, and toe slopes. These soils have a lighter colored surface layer than this Cedargap soil or a thinner, dark colored surface layer.

Permeability in this Cedargap soil is moderately rapid, runoff is slow, and available water capacity is low. The response to soil amendments is good.

Most areas of this soil have been cleared of trees and brush and are in pastureland or hayland. Some limited access, narrow or poorly shaped areas are in woodland. A small part of some areas is in cropland. In places, accessible, well shaped areas that are fenced or otherwise protected from grazing are suitable for cropland. If this soil is used for cultivated crops, droughtiness during the growing season and frequent brief flooding from late in fall to early in spring are the major concerns of management. This soil is suited to small grain, sorghums, and corn, especially for forage.

This soil is suited to grasses and legumes grown for pasture and hay (fig. 20). Overgrazing pasture reduces the forage yield and increases the growth of weeds. Forage quality, soil condition, and plant production can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing. Streambank management and good ground cover can reduce scouring and other flood damage.

This Cedargap soil is suited to trees, and stands of native hardwoods are in limited access areas, on streambank borders, and in other inaccessible areas. Black walnut populations can be increased by planting. Seedling mortality is moderate. Planting special stock of larger size than normal helps to achieve a better stand. Protection from fire and grazing can increase production and improve quality. Other management problems are slight.

Most areas of this soil are suitable for the development of habitat for openland and woodland wildlife. Plantings of grain sorghum, grasses, legumes, shrubs, and trees in cleared areas can greatly increase the food supply and improve cover if grazing is controlled or prevented. Leaving dense brushpiles of the waste products of land clearing and timber cutting on adjacent upland can provide secure winter cover for many species of wildlife.

This soil is generally not suited to sanitary facilities and building site development because of frequent flooding.

This Cedargap soil is in capability subclass IIIs and woodland capability subclass 3f.

95—Cedargap silt loam. This deep, nearly level, well drained soil is on the flood plains of small streams. Slope is less than 2 percent. Flooding is frequent. Individual areas are long, narrow to relatively wide, and range from about 10 acres to 200 acres or more.

Typically, the surface soil is about 20 inches thick. It is very dark grayish brown silt loam in the upper part and very dark brown silt loam in the lower part. The substratum to a depth of about 72 inches is very dark grayish brown very cherty silty clay loam in the upper part and very dark grayish brown very cherty silt clay in the lower part. In places, the surface soil is cherty.

Figure 20.—Cattle grazing grasses and legumes in an area of Cedargap cherty silt loam.

Included with this soil in mapping and making up as much as 15 percent of mapped areas are Peridge, Pembroke, and Secesh soils. Also included are a few small areas of Huntington soils. The gently sloping Pembroke, Peridge, and Secesh soils are on terraces. The Huntington soils are on flood plains. Pembroke, Peridge, and Huntington soils do not have chert in the upper part of the profile, and Secesh soils have less chert than this Cedargap soil.

Permeability in this Cedargap soil is moderately rapid, runoff is slow, and available water capacity is moderate. The response to soil amendments is good.

Most areas of this soil are in pastureland or hayland. Some areas are in cultivated cropland. A few narrow limited access areas are in woodland. Areas that are fenced or can be economically fenced or otherwise protected from grazing are suitable for cropland. Frequent, brief flooding from late in fall to early in spring and droughtiness during the growing season are major concerns of management. Preferred crops are sorghums, soybeans, corn, and small grain.

Most areas of this soil are suited to grasses, legumes, and small grain for pasture and hay. Overgrazing the pasture reduces the yield of grasses and legumes and increases the growth of weeds. Forage quality and production as well as soil condition can be improved by proper fertilization, pasture rotation, controlled stocking rates, and timely deferment of grazing. Good ground cover and streambank management can reduce stream scour and other kinds of flood damage.

This soil is suited to trees. Existing stands of hardwoods, especially in limited access or odd areas that border fences and stream channels, can economically remain in woodland. Black walnut populations can be increased by planting (fig. 21). Seedling mortality is moderate. Planting special stock of larger size than normal helps achieve better seedling survival. Protection from fire and grazing increases production and improves quality. Other management problems are slight.

Most areas of this soil are suited to habitat for openland and woodland wildlife. Some grainfields, idle land, and wooded areas that border fences and drainageways of cropland produce good cover and an adequate supply of food. If grazing can be controlled or prevented, plantings of grain sorghums, grasses,

Figure 21.—Young stand of black walnut trees on Cedargap silt loam.

legumes, shrubs, and trees in cleared areas greatly increase the food supply and improve cover. If the waste products of timber cutting and land clearing are placed in dense brushpiles on adjacent uplands, they serve as secure winter cover for many species of wildlife.

This soil is generally not suited to sanitary facilities and building site development because of frequent flooding.

This Cedargap soil is in capability subclass IIs and woodland suitability subclass 3f.

240—Gerald silt loam. This deep, nearly level, somewhat poorly drained soil is on the tops of broad ridges on uplands. Slope is 0 to 2 percent. Individual areas range from about 10 acres to 40 acres or more.

Typically, the surface layer of the Gerald soil is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil above the fragipan is dark brown, mottled, very firm silty clay over clay (fig. 22) about 12 inches thick. The fragipan is about 20 inches thick. The upper part is light brownish gray and yellowish brown, mottled, firm silt loam, and the lower part is multicolored, firm cherty silty clay loam. The subsoil below the fragipan is dark red, mottled, very firm very cherty clay.

Included with this soil in mapping and making up as much as 15 percent of mapped areas are Parsons and Creldon soils. The Parsons soils are on the crest of the wider ridgetops and do not have a fragipan. The moderately well drained Creldon soils are on the gently sloping sides and points of ridges.

This Gerald soil is very slowly permeable, runoff is slow, and available water capacity is moderate. A perched water table is at a depth of 1 foot to 2 feet from December through April in most years. Shrink-swell potential is high in the subsoil above the fragipan. The root zone is limited by the fragipan at a depth of 18 to 40 inches. The response to soil amendments is good.

Most areas of this soil are in cropland and pastureland. This soil is suited to soybeans, sorghums, or corn in rotations that include small grain and grass-legume meadow. Seasonal wetness and susceptibility to erosion are the major concerns of management if this soil is used for cropland. Available water capacity is moderate, but inadequate soil moisture is commonly a limitation for crops in summer. Because of this, the choice of crops is reduced or moderate conservation

practices are needed. Under highly specialized management, row crops can be grown year after year. The proper management of crop residue and the use of cover crops and green manure crops in the cropping system help to maintain the organic matter content,

Figure 22.—Profile of Gerald silt loam. Note the clay subsoil above the fragipan. Depths are shown in feet. Photo courtesy of C. L. Scrivner, University of Missouri Agricultural Experiment Station.

insure good tilth, and increase available water. On long slopes, minimum tillage, terraces, or cross-slope channels help to control erosion.

Overgrazing the pasture reduces the yield of grasses and legumes and increases the growth of weeds. Grazing when this soil is too wet causes surface compaction, poor tilth, and excessive runoff. Pasture quality, soil condition, and forage production can be improved by proper fertilization, controlled stocking rates, pasture rotation, timely deferment of grazing, and restricting use during wet periods.

This soil is suited to building site development and to some onsite waste disposal systems. Sewage lagoons function adequately. Factors to consider in design are seasonal wetness, very slow permeability because of the fragipan at a depth of 18 to 40 inches, and high shrink-swell potential in the clayey subsoil. Sewer lines should be connected to community sewers, if available. Basement walls, foundations, and footings of dwellings and commercial buildings need to be properly designed and constructed with adequate reinforcement to prevent damage from high shrinking and swelling of the soil. Drainage tile installed around footings and foundations helps to prevent damage from excessive wetness. Providing proper drainage to local roads and streets by the use of side ditches and culverts lowers the water table and helps to prevent damage caused by frost action and shrinking and swelling. Suitable base material should be added to this soil to overcome the low strength.

This Gerald soil is in capability subclass IIw.

241B—Parsons and Sampsel silt loams, 1 to 3 percent slopes. This map unit consists of deep, very gently sloping, somewhat poorly drained and poorly drained soils on the tops, sides, and foot slopes of low ridges on uplands. The Parsons soils have mainly convex slopes, and slope is less than 2 percent. The Sampsel soils have dominantly concave slopes, and slope is more than 2 percent. The extent of Parsons and Sampsel soils varies from one area to another. Generally, both soils are present, but some areas have only one of these soils. An average area consists of about 40 percent Parsons soils and 35 percent Sampsel soils. Individual areas range from about 5 acres to 30 acres or more. Commonly, areas are dissected by small intermittent stream channels. Eroded spots, erosional scars, and erosional debris are near some of these channels.

Typically, the surface layer of the Parsons soil in this unit is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 27 inches thick. The upper part is very dark grayish brown and dark grayish brown, mottled, very firm clay, and the lower part is mottled strong brown and dark grayish brown, very firm clay. The substratum to a depth of 64 inches is multicolored silty clay loam. In a few places,

the surface layer is dark grayish brown. In places, the lower part of the subsoil is cherty or gravelly.

Typically, the surface layer of the Sampsel soil in this unit is very dark gray silt loam about 7 inches thick. The subsoil to a depth of about 60 inches is black and very dark gray, firm silty clay loam over silty clay in the upper part; gray, mottled, firm silty clay in the middle part; and mottled strong brown, gray, and dark grayish brown, firm clay loam in the lower part. In places, the surface layer is light colored, or the dark colored surface layer is less than 6 inches thick. In other places, the surface layer is silty clay loam, or the lower part of the subsoil is cherty or gravelly.

Included with these soils in mapping and making up 10 to 15 percent of mapped areas are Carytown, Hepler, Lanton, and Osage soils. All of these soils are nearly level. The Carytown soils are on uplands and terraces and have a light colored surface soil. The Hepler soils are on low terraces and have less clay in the upper part of the subsoil than the major soils in this unit. The Lanton and Osage soils are on flood plains and are dark colored to a depth of 24 inches or more.

Permeability is very slow in the Parsons soil and slow in the Sampsel soil. In both soils surface runoff is medium, available water capacity is moderate, and shrink-swell potential is high. Also, both soils have a perched water table at the surface to a depth of 1.5 feet from November to April in most years. The response to soil amendments is good.

Most areas of this unit are in cropland and pastureland. The acreage of forage and grain crops is about equal. These soils are suited to sorghums, soybeans, and to a lesser extent, corn. Surface runoff and seepage from adjacent areas can be diverted by dikes or diversion terraces. Erosion can be controlled by constructing grass waterways, filling and smoothing areas dissected by small intermittent stream channels or gullies, and building field terraces. Minimum tillage also helps to control erosion. The proper utilization of crop residue helps to maintain organic matter content, provide good tilth, and increase available water.

Grasses, legumes, and small grain grown for pasture and hay effectively control erosion. Grazing when these Parsons and Sampsel soils are wet, especially in winter and early in spring, causes compaction and poor tilth. Overgrazing increases the growth of weeds and reduces the yield of grasses, legumes, and small grain. Pasture quality, soil condition, and forage production can be improved by fertilization, restricting use when the soil is wet, proper stocking rates, pasture rotation, and timely deferment of grazing.

These soils are suited to building site development and to some onsite waste disposal systems. Most areas are suitable for sewage lagoons. Factors to consider in design are high shrink-swell potential, wetness, very slow or slow permeability, and the clayey subsoil. Surface runoff from adjoining soils can be diverted with diversion terraces. Sewerlines should be connected to sewage lagoons or to community sewers, if available. Damage from the shrinking and swelling of the soil can be prevented by proper design and construction, together with adequate reinforcement of footings, foundations, and basement walls. Drainage tile installed around footings, foundations, and basement walls helps to prevent damage from excessive wetness. Local roads and streets should have proper drainage. Adding well compacted, raised fill material to roads and streets and providing side ditches and culverts lower the water table and help to prevent damage caused by wetness, frost action, and shrinking and swelling. Suitable base material should be added to overcome low strength.

These Parsons and Sampsel soils are in capability subclass IIe.

245—Carytown silt loam. This deep, nearly level, poorly drained soil is on flats and in depressions on uplands and terraces. Slope ranges from 0 to 2 percent. Individual areas range from about 5 acres to 100 acres or more.

Typically, the surface layer is dark grayish brown and very dark grayish brown silt loam about 8 inches thick. The subsurface layer is light brownish gray and grayish brown, mottled silt loam about 9 inches thick. The subsoil is about 33 inches thick. The upper part is very dark grayish brown and dark grayish brown, mottled, very firm silty clay and clay. The lower part is mottled, olive brown, gray and dark gray very firm clay. The substratum to a depth of 62 inches is gray and dark gray, mottled, very firm clay. In places, the surface layer is very dark grayish brown and more than 6 inches thick. Also, in places the surface layer of slick spots and eroded spots is silty clay.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are Parsons and Gerald soils; making up as much as 5 percent are Hepler and Sampsel soils. All of these soils are on positions similar to those of this Carytown soil. The Gerald, Parsons, and Sampsel soils are on uplands, and the Hepler soils are on terraces. All of these soils have a darker or thicker, dark colored surface layer than this Carytown soil. The Gerald soils have a fragipan, and Sampsel soils are gently sloping.

The Carytown soil is very slowly permeable, runoff is slow, and available water capacity is moderate. A perched water table is at a depth of less than 1 foot from December to April in most years. Sodium content in the subsoil and substratum is high. The shrink-swell potential is high. The response to soil amendments is fair.

Most areas of this Carytown soil are in cropland, pastureland, or hayland. Cropland exceeds the combined acreage of pastureland and hayland. This soil is suited to soybeans, sorghums, and to a lesser extent, corn. Areas of this soil are seasonally wet and to a lesser degree seasonally dry. Long slopes that have a gradient exceeding 1 percent are susceptible to erosion. These

hazards along with slick spots and eroded spots in some areas are the major concerns of management if this soil is used for cropland. Tilling the soil under optimum moisture conditions and the proper utilization of crop residue help to maintain good tilth and organic matter content and to increase available water. Land smoothing and shallow surface ditches improve drainage. Seepage and surface runoff from adjacent areas can be intercepted and diverted by diversion terraces. Field terraces and cross-slope ditches help to control erosion. Supplemental irrigation is beneficial, but the availability of an adequate water supply is limited.

Wetness in winter and spring is a concern of management if this soil is used for pasture. Also, inadequate soil moisture is commonly a limitation during summer. Grazing when the soil is wet causes poor tilth, compaction, and excessive runoff. Overgrazing increases the growth of weeds and reduces the yield of grasses and legumes. Pasture quality, soil condition, and forage production can be improved by restricting use during wet periods, the application of fertilizer as needed, proper stocking rates, pasture rotation, and timely deferment of grazing.

Areas of this soil are suited to building site development and sewage lagoons if seepage and surface runoff from higher slopes on adjoining soils are intercepted and diverted. Wetness, very slow permeability, the sodium-rich, clayey subsoil, and high shrink-swell potential are factors to consider in design. Sewerlines should be connected to sewage lagoons or community sewers if available. Land smoothing, grading, and shallow surface ditches improve drainage. Footings, foundations, and basement walls of buildings should be designed and constructed with adequate reinforcement to prevent damage from the swelling and shrinking of the soils. Drainage tile around footings and foundations helps to prevent damage from excessive wetness. Local roads and streets should be properly drained by side ditches and culverts. These structures lower the water table and prevent damage caused by wetness and shrinking and swelling. Suitable base material should be added to overcome low strength of the soil.

This Carytown soil is in capability subclass IIIw and woodland suitability subclass 5w.

921—Secesh-Cedargap silt loams. This map unit consists of deep, nearly level, well drained to somewhat excessively drained soils on stream terraces and flood plains. Slope is less than 2 percent. Flooding is frequent on Cedargap soils and occasional on Secesh soils. Secesh soils are on terraces, and Cedargap soils are on flood plains. The extent of these soils varies from one area to another. In some areas both soils are present, in other areas only one soil. An average area consists of about 40 percent Secesh soils and 35 percent Cedargap soils. Individual areas are long, relatively narrow, and about 10 acres to 100 acres or more.

Typically, the surface layer of the Secesh soil in this map unit is dark brown silt loam about 8 inches thick. The subsoil to a depth of about 60 inches is brown, friable silt loam in the upper part; brown, mottled, friable cherty silty clay loam over reddish brown, mottled, friable silty clay loam in the middle part; and brown, mottled, firm very cherty silty clay loam in the lower part. In places, the dark brown surface layer is more than 10 inches thick, and in other places it is less than 6 inches thick. In several places, the surface layer is brown or dark grayish brown.

Typically, the surface layer of the Cedargap soil in this map unit is about 16 inches thick. The upper part is very dark grayish brown silt loam, and the lower part is very dark grayish brown cherty silt loam. The substratum to a depth of about 60 inches is dark brown cherty loam in the upper part, very dark grayish brown very cherty clay loam in the middle part, and dark brown cherty clay loam in the lower part. In places, the combined thickness of the very dark grayish brown surface soil and subsoil is about 10 to 24 inches. In other places, the surface layer is cherty. Also, in some places the 10- to 40-inch zone does not contain as much as 35 percent chert or other coarse fragments.

Included with these soils in mapping and making up 10 to 15 percent of mapped areas are Huntington, Pembroke, Peridge, and Waben soils. The Pembroke and Peridge soils do not have chert in the upper 40 inches and are on more sloping parts of terraces. The Huntington soils do not have chert and are on flood plains. The Waben soils have less chert and a lighter colored surface layer than the major soils in this unit and are on more sloping parts of terraces.

Secesh soils are moderately permeable. The permeability in the Cedargap soils is moderately rapid. Surface runoff on both soils is slow, and available water capacity is moderate. The response to soil amendments is good.

Most areas of this unit are in pastureland or hayland. Some areas are in cropland. A few limited access or otherwise isolated areas are in woodland. Many areas that are fenced or that can be economically protected from grazing are suitable for cropland. Sorghums, soybeans, corn, and small grain are preferred crops. The major concerns of management are frequent flooding of the Cedargap soils and occasional flooding of the Secesh soils. Inadequate soil moisture is commonly a limitation during summer. Another concern of management is erosion on the long, 1 to 2 percent slopes of the Secesh soils. The proper use of crop residue, cover crops or green manure crops in the cropping system, and minimum tillage improve the organic matter content, provide good tilth, increase available water, and reduce surface runoff. These practices, together with needed diversions or field terraces, also help to control erosion.

Most areas of this unit are suited to grasses, legumes, and small grain for pasture and hay. Overgrazing the pasture reduces forage yield, increases the growth of weeds, and makes long slopes more susceptible to

erosion. Forage quality and production can be improved by proper fertilization. Proper stocking rates, pasture rotation, and timely deferment of grazing help to maintain the pasture and soil in good condition. Good ground cover and streambank management help to control erosion and reduce flood damage.

The soils in this unit are suited to trees. Stands of hardwoods are in some areas, especially in limited access or odd areas that border fence rows and stream channels. The population of black walnut trees can be increased by planting. Fire protection and controlled grazing increase production and improve the quality of trees. Seedling mortality on Cedargap soils is moderate. Planting special stock of larger size than normal increases chances of seedling survival.

Most areas of this unit produce good habitat for openland and woodland wildlife. Grainfields, idle land, and wooded areas that border fences and drainageways of cropland produce an abundance of food and good cover most of the year. If grazing is controlled or prevented, plantings of grain sorghums, grasses, legumes, shrubs, and trees in cleared areas greatly improve wildlife habitat. The waste products of land clearing and timber cutting can be piled into dense brushpiles on adjacent upland or on areas of this unit that are protected from flooding. The brushpiles serve as secure winter cover for rabbits, furbearers, quail, and other wildlife.

The soils in this unit are generally not suited to building site development and onsite waste disposal because of occasional or frequent flooding. Buildings and sanitary facilities can be located on areas of Secesh soils, if they are protected from flooding.

These Secesh and Cedargap soils are in capability subclass IIs. Woodland suitability subclass for Cedargap soils is 3f, and woodland suitability subclass for Secesh soils is 4o.

931—Waben-Cedargap cherty silt loams, 0 to 5 percent slopes. This map unit consists of deep, nearly level and gently sloping, well drained Waben soils and nearly level, somewhat excessively drained Cedargap soils. The Waben soils are on narrow terraces, alluvial-colluvial fans, and foot slopes. The Cedargap soils are on narrow flood plains. Flooding on the Cedargap soils is frequent. The extent of Waben and Cedargap soils varies from one individual area to another. Both soils are generally in an area, but some areas have only one soil. An average area consists of about 45 percent Waben soils and 40 percent Cedargap soils. Individual areas range from about 20 acres to several hundred acres. Many areas are long, narrow, and dissected by stream channels; some are inaccessible, isolated, or irregular in shape.

Typically, the surface layer of the Waben soil in this unit is brown cherty silt loam about 7 inches thick. The subsoil to a depth of about 72 inches is brown, very friable cherty silt loam in the upper part; yellowish red, friable very cherty silt loam and very cherty silty clay loam in the middle part; and reddish brown, mottled, firm silty clay loam and very cherty loam in the lower part. In places, the surface layer is dark brown and 6 to 10 inches thick.

Typically, the surface soil of the Cedargap soil in this unit is very dark brown cherty silt loam about 19 inches thick. The substratum to a depth of about 72 inches is very dark brown very cherty silt loam in the upper part and multicolored cherty silty clay loam in the lower part. In areas, the combined thickness of the very dark brown surface soil and the upper part of the subsoil is 10 to 24 inches. In places, the surface soil to a depth of 20 inches is relatively chert free. Near the source of some small streams, the depth to limestone bedrock is less than 60 inches.

Included with these soils in mapping and making up 10 to 15 percent of mapped areas are Secesh, Clarksville, and Wilderness soils. The Secesh soils are on stream terraces and contain less chert and gravel in the surface layer and upper part of the subsoil than the major soils in this unit. The Wilderness and Clarksville soils are on uplands at a higher elevation.

Permeability in Waben and Cedargap soils is moderately rapid. Surface runoff is medium on Waben soils and slow on Cedargap soils. The available water capacity is low. The response to soil amendments is good.

Most areas of these soils have been cleared of trees and brush and are in pastureland or hayland. Some irregularly shaped and limited access areas are in woodland. Small parts of some areas are in cropland. Accessible, well shaped areas that are fenced or otherwise protected from grazing are suitable for cropland. They can be economically used to grow small grain, sorghums, or corn crops, especially for forage. Both soils are droughty. Cedargap soils are frequently flooded for very brief periods from late in fall to early in spring in most years. Susceptibility to erosion is also a concern of management if the gently sloping Waben soils are used for cultivated crops. Diversions and terraces help to control erosion in most sloping areas. The proper use of crop residue and including cover crops or green manure crops in the cropping system maintain the organic matter content, improve tilth, and increase available water.

Cleared areas of these soils are suited to grasses and legumes for pasture and hay. Overgrazing pasture reduces the forage yield and increases the growth of weeds. Forage quality and production as well as soil condition can be improved by proper fertilization, controlled stocking rates, pasture rotation, and timely deferment of grazing. Streambank management and good ground cover help to reduce stream scour and other flood damage.

The soils in this unit are suited to trees. Stands of native hardwoods are in many areas. The removal of undesirable trees, protection from fire, and controlled

grazing improve the quality and growth rate. Seedling mortality is moderate. Planting special stock of larger size than normal or planting containerized stock helps to achieve better survival.

Most areas of these soils are suitable for development as habitat for openland and woodland wildlife. Most existing pastureland and woodland areas produce scant to fair cover and a meager supply of food. Plantings of grain sorghums, grasses, legumes, shrubs, and trees in cleared areas can greatly increase food production and protective cover if grazing is controlled or prevented. Waste materials from land clearing and timber cutting can be piled into dense brushpiles on Waben soils or on adjacent uplands and serve as secure winter cover for many wildlife species.

The Cedargap soils are generally not suited to sanitary facilities and building site development because of frequent flooding. The Waben soils are suited to septic tank absorption fields, building site development, and local roads and streets. Onsite investigation is needed to locate suitable areas of Waben soils if building site development is planned.

These Waben and Cedargap soils are in capability subclass IIIs and woodland suitability subclass 3f.

940—Dumps-Orthents complex. This complex consists of gently sloping to steep mine dumps and gently sloping and moderately sloping, well drained to somewhat poorly drained Orthents on uplands, narrow terraces, and flood plains.

The dumps consist of spoils, mostly limestone and chert rock fragments, from deep and shallow mine shafts. They also consist of the subsequent debris from mining and processing of lead and zinc ore, soil material from the overburden removed prior to mining, and refuse randomly dumped after mining operations were abandoned. The Orthents consist mostly of landfills constructed in the last decade. They are made by filling the shallow, open trenches with refuse at hand and the mine shafts with stone and other coarse rock fragments taken from the dumps. After filling, the area is covered with a thick layer of soil material mixed with chert and other debris from the dumps and adjacent or nearby included soils.

The extent of dumps and Orthents in individual areas varies greatly from place to place, but averages about 40 percent dumps and 20 percent Orthents. Several large areas of this unit are near Aurora. Baldwin Park is part of one of these. Small areas also occur elsewhere in the survey area. Individual areas are irregular in shape and range from 3 to 100 acres or more.

Typically, the cover of a landfill is about 40 inches thick. The texture of the soil material at any depth ranges widely over short horizontal distances. Texture is dominantly cherty and loamy but ranges to stony loamy and cherty or stony clayey. Most fills contain pieces of glass, brick, asphalt, and concrete. In places, the landfill is thicker or thinner than 40 inches. Where the fills are thicker, pockets of refuse are generally included in the mixture. The concentration of stones, chert, and chat increases as depth increases, so that in some places the fine earth does not fill the space between the coarse fragments. The refuse in the fill material has been incinerated in most places.

Included with this unit in mapping are as much as 10 percent Creldon soils, 10 percent Hoberg soils, and 5 percent Keeno soils or 10 percent Viraton and Wilderness soils. Also included are small areas of Cedargap, Hepler, Huntington, and Secesh soils. The Creldon, Hoberg, Keeno, Viraton, and Wilderness soils are on uplands. The Cedargap and Huntington soils are on flood plains. The Hepler and Secesh soils are on terraces.

Permeability is most commonly moderate or slow but ranges to very slow or impermeable where chat is packed on the surface. Runoff is medium in most places but varies from slow to rapid. In most places, the available water capacity is low or very low. This is because the landfills and dumps contain large amounts of coarse fragments. This unit has a moderate erosion hazard. The response to soil amendments is fair or poor.

Landfills in this unit have a fair cover of grasses, legumes, and weeds. Patches of brush, grasses, and weeds are on the mine dumps. The included soils and waste areas associated with the dumps have a fair to good cover of mostly grasses and legumes but include scattered trees, patches of weeds, and woodland. Most areas of this unit are grazed or used for recreation purposes. Some areas are idle. The landfills, included soils, and many associated waste areas have fair to good suitability for grasses and legumes and recreation development. The suitability for trees is poor because the available water capacity is low. All or part of many areas have some potential as a site for commercial buildings or family dwellings. This unit is so variable that onsite investigation is needed to determine the potential and limitations for building sites and other proposed uses.

This unit is not assigned to an interpretative group.

941—Pits and Dumps. This map unit consists of open excavations or pits from which limestone has been or is now being quarried, nearly level to steep dumps of waste rock and soil material, stockpiles of marketable stone, and open areas of upland. Pits and Dumps make up about 70 percent of this unit, and the acreage of each is about equal in extent. Individual areas are less than 5 acres to 200 acres or more.

Typically, each side of a pit or quarry has a vertical face or exposure of the limestone rock that is being or has been quarried. These exposures extend upward from the bottom of the pit to a height of about 10 to 40 feet. Above the limestone rock the overburden of soil and unconsolidated soil material is about 5 to 15 feet thick. Prior to quarrying, the overburden is removed. Waste rock fragments and soil material are dumped, and the

marketable stone stockpiled as the stone is quarried and processed. Buildings, roads, and other structures and works used in processing the limestone or the manufacture of lime cover most of the remaining land area. Some abandoned quarries have no outlet and are partially filled with water. Also, some are partially or almost completely filled with waste rock fragments, soil material, and refuse.

Included with this unit in mapping and making up as much as 15 percent of mapped areas are Goss, Eldon, and Gasconade soils. In places, the surface layer of the included soils has a thin cover of finely broken limestone or chert and other debris. The gently sloping to strongly sloping Goss and Eldon soils are on the sides and tops of upland ridges. The Gasconade soils are on the landscape breaks.

In the included soil areas, permeability is restricted, runoff is medium to rapid, and available water capacity is low.

Droughtiness and susceptibility to erosion severely restrict this unit for plants. A large part of many areas is void of vegetation. A scant cover of grasses, weeds, and brush is on the dumps of soil material, and a good or fair cover is on the included soils. Many abandoned quarries, especially in rural areas, are grazed. The vegetated lands at most operating quarries are not grazed or otherwise used. Most areas of this unit where quarry operations are complete or abandoned have potential for certain kinds of recreation, wildlife habitat development, and storage of selected solid waste. Reclaimed land around and between the pits has potential for grazing, especially in rural areas. Similar reclaimed land in or near urban areas has potential for selected kinds of structures and works. For example, as the limestone is quarried, space can be made available for underground storage (*12*). This map unit is so variable that onsite investigation is needed to determine its potential and limitations for any proposed use.

This unit is not assigned to an interpretative group.

943—Orthents, nearly level to strongly sloping. This map unit consists mainly of landfills constructed to dispose of refuse. These manmade soils are on flood plains, uplands, and terraces. They are made up of several feet of refuse in trenches covered with a thick layer of soil material. Most large areas of this unit are near the city of Springfield. Small areas are elsewhere in the survey area. Individual areas range from 3 to 40 acres or more.

In a typical area of Orthents, the cover of the landfill is a mixture of cherty clayey, cherty loamy, and loamy soil material about 40 inches thick. The texture at any given depth ranges widely over short horizontal distances. In places, stones are on the surface, in the fill, or both of these. In most places, the cover material contains pieces of concrete, brick, glass, metal, plastic, or asphalt. Refuse extends from the base of the cover to an undetermined depth. This refuse varies widely in content and degree of decomposition. In many places, it consists of garbage, glass, cinders, rubber tires, scrap plastic, and paper. In some places, it also consists of metal objects, such as car wheels, wire, and tin cans. In many places, especially at new landfills, the refuse is raw, having undergone little decomposition, and in other places, it is almost completely incinerated. In most places, an odor of gas emanates from pits dug into the refuse. In places, the refuse is as much as 10 to 20 feet thick, and the daily accumulation is separated by a thin layer of soil material.

Included with these soils in mapping are filled areas that have cover material less than 40 inches thick, filled areas that are not underlain by refuse, a few small areas of Rock outcrop, and a few isolated pits from which limestone has been quarried. Another inclusion is the major part of a large, old landfill that has sewage sludge mixed into the upper part of the cover material. These inclusions make up about 15 percent of mapped areas.

Permeability is moderate or slow in this unit. Runoff is most commonly medium but ranges from slow to rapid. The available water capacity is low. The erosion hazard is slight to severe. Where sewage sludge has been spread on the surface, the upper part of the fill material is dense and compacted.

Most areas of this unit have a scant to fair cover of grasses, legumes, and weeds. They are mostly used for recreation or grazing. Some areas are idle. Most areas have fair to good potential for grasses and legumes and recreation development. The potential for trees is poor because the available water capacity is low. Plants grown on any of this land that has sewage sludge on the surface could receive toxic metals. The potential for building sites is poor because the high gas level in the refuse underlying this unit is a building hazard, and most areas are subject to subsidence. Careful onsite investigation prior to construction is essential if these areas are to be used for building sites.

This unit is not assigned to an interpretative group.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the best land for producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops. If it is properly treated and high level management and

acceptable farming methods are used, prime farmland produces the highest yields with minimal inputs of energy and economic resources, and its use results in the least damage to the environment.

Prime farmland in the survey area can now be in cropland, pastureland, woodland, or other land uses but not in Urban land, built-up land, or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent. For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service or the Missouri University Extension Service.

About 178,600 acres or 41 percent of Greene County and about 198,000 acres or 50 percent of Lawrence County meet the soil requirements for prime farmland. In Greene County the largest amounts are in soil associations 1, 2, 3, 7, and 9. In Lawrence County the largest amounts are in associations 1, 2, 3, 5, 7, and 8. Most of the remaining areas are scattered, small areas in other associations. The largest amounts of cultivated cropland are in soil associations 2, 3, 5, 7, and 8.

The loss of prime farmland has been to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate, and generally less productive.

Soil map units that make up prime farmland in Greene and Lawrence Counties are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have limitations—high water table or frequent flooding—may qualify for prime farmland if these limitations are overcome by such measures as drainage or flood control. In the following list, these limitations are shown in parentheses after the map unit name. Most soils that are indicated, "where drained," have already been sufficiently drained by back furrows, end row ditches, dead furrows, and road ditches, along with spot drainage and land smoothing. Onsite evaluation is necessary to determine if these limitations have been overcome by corrective measures, or if some areas of the unit are flooded once or less in 2 years during the growing season.

The map units that meet the soil requirements for prime farmland are:

1B—Newtonia silt loam, 1 to 3 percent slopes
2B—Pembroke silt loam, 1 to 5 percent slopes
6B—Creldon silt loam, 1 to 4 percent slopes
9B—Needleye silt loam, 1 to 3 percent slopes
10—Bado silt loam (where drained)
11B—Sampsel silty clay loam, 2 to 5 percent slopes (where drained)
16B—Barco fine sandy loam, 2 to 5 percent slopes
21B—Peridge silt loam, 2 to 5 percent slopes
23B—Bolivar fine sandy loam, 2 to 5 percent slopes
24—Parsons silt loam (where drained)
54—Lanton silt loam (where drained and where flooding during the growing season is once or less in 2 years)
55—Huntington silt loam
56—Osage silty clay loam (where drained)
61B—Hoberg silt loam, 2 to 5 percent slopes
76—Hepler silt loam (where drained)
81B—Viraton silt loam, 2 to 5 percent slopes
95—Cedargap silt loam (where flooding during the growing season is once or less in 2 years)
240—Gerald silt loam (where drained)
241B—Parsons and Sampsel silt loams, 1 to 3 percent slopes (where drained)
921—Secesh-Cedargap silt loams (Secesh part only)

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Dean E. Morgan and Kees W. Vandermeer, soil conservationists, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Most of the soils in the survey area are in cropland and pastureland. Corn, soybeans, wheat, and grain sorghum are the principal cultivated crops. Tall fescue, orchardgrass, alfalfa, lespedeza, red clover, and sundangrass are the major forage producing plants.

The major limitations to use and management of the soils for field and pasture crops are erodibility, wetness, and droughtiness. All of the soils need management to help conserve water, maintain or increase the organic matter content and fertility level, and preserve good tilth. A combination of vegetative and mechanical practices is needed for controlling erosion.

Good management of the soil resources significantly increases crop and pasture yields. The management practices needed for most of the soils that are suited to crops and pasture are briefly discussed in the following paragraphs. This discussion supplements the managment suggestions regarding specific practices given for each unit in the section "Detailed soil map units."

High fertility levels increase the yields of grain and forage. The kind and amount of soil amendments needed to maintain or increase fertility levels can be determined by soil tests. Maintaining a complete record of the kind and amount of fertilizers applied, the time amendments were made, and the yields obtained is desirable to properly evaluate effectiveness. Dense-growing crops reduce the destructive impact of falling raindrops on the soil. Large amounts of residue left on the surface after harvest can increase the organic matter content and keep the soil porous, thereby increasing the intake rate and the available water capacity.

Managing plant residue so that it is left on or near the surface can also retard runoff and help to control erosion. The effectiveness in controlling erosion depends on the amount of residue and the length of time it is left on the surface. Thus, spring plowing that allows residue to remain on the surface over winter is more effective than fall plowing, which leaves the surface bare. The use of tillage implements that leave residue on the surface during the growing season is desirable.

Minimum tillage helps to maintain good tilth, increase infiltration, and reduce erosion. It includes the use of chisel plows, direct planting of conventionally plowed fields, and other methods that reduce tillage.

Some soils, under special management, can be continuously intertilled without excessive erosion. These include soils on bottom lands and some nearly level soils on uplands. Special management for intensive cropping generally involves maintaining fertility, managing crop residue, and applying minimum tillage. These practices are combined with grassed waterways, terraces, diversion terraces on uplands, or drainage systems in bottom lands.

Grassed waterways are effective in controlling erosion where natural drainageways accumulate runoff. Properly located, natural or constructed grassed waterways also serve as terrace outlets where terraces are needed. Crossable waterways can be designed that are convenient for farming with large machinery.

Field terraces reduce the length of slope and are effective erosion control measures when used on cultivated soils that are sloping. Cultivated soils that have slopes of more than 2 percent should generally be terraced and farmed on the contour. A system of terraces that are nearly parallel to each other is better than other systems, because it eliminates excessive point rows and makes farming more convenient.

Many good stands of high yield grass-legume pasture have been established in the survey area. More pasture renovations and improved management are needed to protect the soil from erosion and to increase income.

Establishing a good pasture generally is successful if a few simple procedures are followed: (1) apply limestone and fertilizer as recommended by current soil tests; (2) prepare clean, firm seedbeds; (3) plant the recommended amount of pure, live seed per acre and cover 1/4 to 1/2 inch; (4) inoculate all legume seeds with proper bacteria within 24 hours of planting; (5) control weeds until new seedlings are well established; and (6) do not graze new pasture plantings until root systems are well established. In addition to the above procedures, only the adapted species of grasses and legumes should be used. Seeding dates for different species vary.

Proper management of permanent pasture increases the life of the stand, maintains the quality and quantity of forage, provides soil protection, and reduces water loss. Some important management practices are proper stocking, maintaining minimum grazing height, application of plant nutrients for healthy, vigorous growth, and rest periods during the grazing season and prior to frost in the fall. Other factors to consider in pasture management are weed control, water distribution, and rotation grazing.

Well planned and managed pasture generally includes cool-season grass-legume mixtures for use during spring and fall. Tall fescue growth can be stockpiled for use in winter by beef herds and nonproducing dairy animals. Surplus spring growth of grasses and legumes can be round-baled and left in the field to extend the grazing season and maintain feed quality. The use of warm-season grasses, such as bermudagrass, the bluestems, indiangrass, and switchgrass, can fill the need for good quality summer forage.

Technical assistance in the planning and application practices for the soils of a particular field or farm can be obtained from the Soil Conservation Service through the Greene County and the Lawrence County Soil and Water Conservation Districts.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability

classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*19*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. There are no class V soils in the survey area.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production. There are no class VIII soils in the survey area.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w,* or *s* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

In class I there are no subclasses because the soils of this class have few limitations.

The acreage of soils in each capability class and subclass in this two-county survey area is shown in table 6. The capability classification of each map unit, except those named at a level higher than the series, Pits and Dumps, or miscellaneous areas, is given in the section "Detailed soil map units."

woodland management and productivity

James L. Robinson, forester, Soil Conservation Service, helped prepare this section.

A 1972 survey of forest land in Greene and Lawrence Counties showed that 58,900 acres, or 14 percent of the total land area in Greene County was commercial forest land and that commercial forest occupied 50,200 acres, or 12 percent of Lawrence County (*6*). These figures indicate that there were considerable decreases in forest land when compared to a survey in 1959 (*5*), which showed Greene County had 86,100 acres of forest land and Lawrence County had 77,900 acres. These differences amount to a loss of 32 percent in Greene County and 36 percent in Lawrence County. A considerable amount of this decrease is attributed to changes from forest land to pasture.

Greene and Lawrence Counties are along an area where the oak-hickory forest of the Ozarks meets the natural prairie to the west. These two major native cover types have played an important part in the development of a diverse landscape within these counties. The forest land commonly follows the drainage patterns into areas of the prairie soils.

The soils in these counties have been grouped into several major soil associations. Soils in the Pembroke-Eldon-Creldon, Hoberg-Keeno-Creldon, Creldon-Parsons, and Keeno-Creldon associations formed under natural prairie grass conditions. Natural forests were not common in areas of these associations, and do not generally occupy them.

The oak-hickory forest is generally in areas of the Goss-Wilderness-Peridge, Wilderness-Viraton, and Clarksville-Nixa associations. White oak, northern red oak, and hickories generally are predominant, although black oak is the main species in some areas. Many combinations of oaks and hickories and other hardwoods are in the oak-hickory forest (*15*). Shagbark and bitternut hickory, white or green ash, black cherry, American elm, winged elm, red maple, and black walnut with an understory of dogwood are some of the more common associates.

Production potential varies greatly within these soil associations by soil and aspect. On the drier sites, generally on south- and west-facing slopes, post oak and blackjack may be dominant, and the production potential for these species is generally low. The production potential for common species is generally medium to medium low. The better growth potential for most species is on such deep, well drained upland soils as Peridge, or on many narrow bottom land soils that occur as inclusions within the soil associations. Black walnut occurs throughout; however, potential production for this species is generally low, and requires long rotations except on the better sites. Eastern redcedar generally dominates areas of Rock outcrop or areas of very shallow or droughty soils, such as Gasconade soils.

The Basehor-Bolivar association is generally occupied by post oak-black oak forest type (*15*). The most common species in this forest type are blackjack oak, white oak, shingle oak, mockernut hickory, pignut hickory, red maple, winged elm, chinquapin oak, dogwood, and eastern redcedar. This forest type generally enroaches on the prairie soils. Generally,

eastern redcedar becomes the predominant species on the shallow, droughty soils and on Rock outcrop sites in this association.

The Huntington association is along the major river bottoms. The common timber species in this association are silver maple, American elm, red maple, slippery elm, cottonwood, sycamore, white or green ash, white oak, pin oak, and black walnut. The soils generally have medium to medium high production potential, but some sites have high potential. Huntington soils are well suited to black walnut trees. Cottonwood and pin oak are generally more common along the somewhat poorly drained to poorly drained soils, such as Lanton soils. Sycamores are along the streambanks and on excessively drained soils, such as Cedargap soils.

Although Greene and Lawrence Counties are not in the natural pine belt in Missouri, shortleaf pine have satisfactory growth on the fragipan soils and on the poorer hardwood sites on slopes that are hotter and face south and southwest. On some sites, a short rotation crop, such as shortleaf pine for posts, may need to be planted.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blow down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings

that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, the Missouri Department of Conservation, or from a nursery.

recreation

Edward A. Gaskins, biologist, Soil Conservation Service, helped prepare this section.

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) shows that 9,578 acres of existing recreation developments are in Greene County and 282 acres are in Lawrence County (*16*). The recreation developments include playfields, fishing waters, boating waters, water suitable for sailboat or canoe use, swimming areas, hunting areas, camping areas, hiking trails, picnicking areas, and winter sports areas. The plan also shows a minimum two-county projected need for an increase in bike, foot, and horse trails, in playfields, and in fishing, swimming, hunting, picnicking, and winter sports areas by 1990.

Eight public recreational areas larger than 100 acres are in Greene County; none are in Lawrence County. These areas are Dickerson Zoo Park, Durst Park and Golf Course, Fellows Lake, Grandview Golf Course, McDaniel Lake, Ritter Springs, and Springfield Lake. All are under municipal control (*4*). The Wilson Creek Battlefield National Park is 10 miles southwest of Springfield on the county line between Greene and Christian Counties.

The Nationwide Outdoor Recreation Inventory (NACD) lists 50 private and semi-private commercial recreation enterprises in the counties, 34 in Greene County and 16 in Lawrence County (*8*). These enterprises vary from transient campgrounds, fee fishing lakes, and boat rentals to church camps, tennis clubs, and rodeo grounds. According to this inventory, projected recreation needs for Greene County are additional natural and scenic areas and picnic and camping areas. Those needed for Lawrence County are campgrounds and recreation resort type areas.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the

surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Edward A. Gaskins, biologist, Soil Conservation Service, helped prepare this section.

Greene and Lawrence Counties are among the 13 counties that comprise the West Ozark Border Zoogeographic Region in Missouri (*13*). The topography ranges from nearly level to steep. The native vegetation was dominantly deciduous hardwoods or tall prairie grasses. Historically, Greene and Lawrence Counties have been oriented toward an agriculture economy. They are among the top 10 beef and dairy producing counties in the State. Both counties are also high in hay production. Industrial growth has been rapid in Greene County (*4*). The rural landscape is changing as more and more homes are being constructed throughout Greene County. However, Lawrence County has retained more of its rural agricultural atmosphere. This urbanization means subsequent loss of wildlife habitat and an increase in posted land. Approximately 20 percent of the survey area is in woody vegetation, including timber, brushy fence rows, and small drainageways; 66 percent is in grassland; and 14 percent is in cultivated cropland and other uses.

A significant amount of the oak-hickory hardwood forest has been converted to grassland during the past 30 years. Some of the major problems affecting the area's wildlife are loss of the habitat base through conversion to pasture and various urban land uses, grazing of the shrinking woodland base, limited grain production, large field size, and lack of suitable edge growth between vegetative types. There are no state-owned public hunting areas or national forest land in these two counties. The wildlife habitat is controlled by the private landowner, and easy access for the purpose of hunting is becoming more and more difficult as additional land is posted. Existing populations of songbirds are rated good to excellent for all soil associations. Populations of furbearing animals are rated high in both counties. Coyote, raccoon, beaver, and mink are the principal species that are trapped.

The Basehor-Bolivar and Clarksville-Nixa associations are the only associations that have 50 percent or more woody areas. These areas and the wooded acreage in the Goss-Wilderness-Peridge and Wilderness-Viraton associations provide the main habitat for woodland wildlife species. The remaining soil associations have an average of 5 percent or less wooded areas. Much of the woodland base in the survey area is being grazed at the present time. The clearing of woodland for conversion to pasture has slowed down considerably and may soon be stabilized. In both counties, deer and turkey populations are small, the number of squirrels is large, and resident woodcock populations are medium.

The Pembroke-Eldon-Creldon, Hoberg-Keeno-Creldon, Huntington, Creldon-Parsons, and Keeno-Creldon associations each contain 5 percent or less areas of wooded vegetation. From 45 to 80 percent of the other four soil associations make up the base habitat for openland wildlife. Roughly, 80 percent of the total land area is in various nonwoodland uses. About 14 percent of this is cropland, and the rest is grassland and in various urban land uses. Tall fescue is the main pasture grass. Row crops in much of the acreage are grown for silage instead of grain. The Huntington and Creldon-Parsons associations have more cropland than other associations; the Huntington association has 60 percent, and the Creldon-Parsons association has 70 percent. Quail populations are small to medium in Greene County and medium to large in Lawrence County. The number of rabbits is large in both counties. The black-tailed jackrabbit is in areas of prairie vegetation. Dove populations are small in Greene County and large in Lawrence County. A fairly stable prairie chicken population is in the northwest corner of Lawrence County in the Creldon-Parsons association. Also, some prairie chickens are in the southwest corner of Lawrence County.

Wetland habitat is very limited in the two-county area, and waterfowl populations are small. Resident wood ducks are on certain streams where existing habitat is adequate, such as Spring River and Center, Honey, and Turnback Creeks. Stockton Lake, a major reservoir in Cedar County, draws many thousands of ducks and geese into the general area to feed. When the lake freezes, many birds move into Lawrence County for open running water and food. The Poirat, a farm in the northwest corner of Lawrence County, commonly hosts a large overwintering population of ducks and geese. At least four great blue heron rookeries are in the two counties.

The James, Sac, Little Sac, and Spring Rivers are principal fishing resources, and along with Asher, Clear, Center, White Oak, Stahl, Williams, Honey, Turnback, and Goose Creeks are considered to be the best fishing waters in the two counties. Primary stream fish are largemouth and smallmouth bass, channel catfish, goggle-eye, carp, suckers, flathead catfish, and various pan fish. In places, rainbow trout are in the headwaters of streams below commercial trout farms. One hundred and thirty-nine miles of permanent flowing streams are in Greene County and 118 miles are in Lawrence County. At the present time, a public access area for fishing is operated by the Missouri Department of Conservation on the James River in Greene County. Another is planned for the Spring River in Lawrence County.

Greene County has four municipal lakes that are available to the public for fishing: Fellows Lake, McDaniel Lake, Springfield Lake, and Ritter Springs. Approximately 4,000 private ponds are in both counties. Many of these have been stocked with fish and offer small impoundment type fishing. The ponds and lakes

are generally stocked with largemouth bass, channel catfish, and bluegill, either alone or in combination. Crappie also are commonly stocked in the large impoundments. One commercial fishing lake is in Greene County and four are in Lawrence County (*8*).

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, soybeans, grain sorghum, millet, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bluegrass, orchardgrass, alfalfa, lespedeza, red clover, trefoil, crownvetch, and switchgrass.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeberry, foxtail, croton, and partridgepea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, wild plum, sumac, persimmon, and sassafras. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive, crabapple, Amur honeysuckle, and hazelnut.

Coniferous plants furnish winter cover, browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cutgrass, cattail, buttonbush, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, prairie chicken, meadowlark, field sparrow, cottontail, woodchuck, mourning dove, coyote, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, raccoon, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They

have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of

landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments more than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is,

perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class. total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*20*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fragiudalfs (*Fragi*, meaning presence of a fragipan, plus *udalf*, the suborder of the Alfisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fragiudalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy skeletal, siliceous, mesic Typic Fragiudalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*18*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*20*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alsup series

The Alsup series consists of deep, moderately well drained soils on uplands. Permeability is moderately slow. These soils formed in a thin mantle of loamy colluvium and clayey residuum weathered from shale under deciduous forest vegetation. Siltstone and some chert are commonly a part of the colluvium. Slope ranges from 2 to 25 percent.

Alsup soils are adjacent to or near Freeburg, Goss, Peridge, Sampsel, and Viraton soils. Freeburg soils are on terraces, and Peridge and Viraton soils are on uplands and terraces. These soils have more silt and

less clay in the control zone than Alsup soils. Goss soils are at a higher elevation or are on positions similar to Alsup soils but have more coarse fragments in the control zone. Sampsel soils are on similar positions but are at a lower elevation and have a mollic epipedon. Viraton soils have a fragipan. Freeburg, Peridge, Sampsel, and Viraton soils are moderately sloping.

Typical pedon from an area of Alsup very stony silt loam, 9 to 25 percent slopes; 1,275 feet south and 200 feet west of northeast corner of sec. 32, T. 31 N., R. 21 W., Greene County:

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) very stony silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; many fine roots; common worm channels and casts; 5 percent fine siltstone fragments; neutral; clear smooth boundary.

A2—4 to 8 inches; light brownish gray (10YR 6/2) silt loam; weak very fine granular structure; very friable; many fine roots; common worm channels and casts; about 5 percent fine siltstone fragments; few fine iron and manganese concretions; slightly acid; clear smooth boundary.

IIB1t—8 to 11 inches; yellowish brown (10YR 5/6 and 5/8) silty clay loam; few fine faint strong brown (7.5YR 5/6) and distinct pale brown (10YR 6/3) mottles; moderate very fine subangular blocky structure; friable; common fine roots; thin patchy clay films on faces of peds; common worm channels and casts; about 5 percent fine siltstone and chert fragments; very strongly acid; clear smooth boundary.

IIB2t—11 to 19 inches; yellowish red (5YR 5/6) and reddish brown (5YR 4/4) silty clay loam; common fine distinct red (2.5YR 4/6) and prominent light olive brown (2.5Y 5/4) mottles; moderate and strong very fine and fine angular blocky structure; firm; thin discontinuous clay films on faces of peds; common fine roots; few worm channels and casts; very strongly acid; gradual smooth boundary.

IIB3t—19 to 34 inches; variegated pale brown (10YR 6/3), pale olive (5Y 6/3), and light gray (10YR 7/2) silty clay; common fine prominent red (2.5YR 4/6) and yellowish red (5YR 4/6) mottles; moderate fine and medium angular blocky structure; firm; few fine roots; thin continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

IIC—34 to 48 inches; light gray (5Y 7/1) silty clay loam; common medium prominent brownish yellow (10YR 6/6) and few fine prominent yellowish red (5YR 5/8) mottles; weak coarse and medium angular blocky structure; firm; few fine roots; few worm channels and casts; very strongly acid; gradual smooth boundary.

Cr—48 to 60 inches; pale olive (5Y 6/3) weathered silty shale.

The thickness of the solum averages about 36 inches but ranges from 23 to 50 inches. Depth to weathered shale is more than 40 inches and in some pedons is more than 60 inches. Siltstones 15 to 30 inches long, 8 to 20 inches wide, and 6 to 12 inches thick are spaced 5 to 30 feet apart on the surface of most very stony, strongly sloping to steep phases.

The A1 or Ap horizon has hue of 10YR, value of 3 through 5, and chroma of 2 or 3. The A horizon is dominantly very stony silt loam or silt loam but ranges to stony or flaggy silt loam and very stony, stony, or flaggy loam. Coarse fragment content ranges from 5 to 35 percent. The A horizon is neutral to strongly acid.

The B2t horizon has hue of 5YR, 7.5YR, and 10YR; value of 4 through 6; and chroma of 4 through 8. It is silty clay loam or silty clay. The B3t horizon is silty clay loam, silty clay, or clay. Coarse fragment content of the Bt horizon ranges from 0 to 5 percent, and reaction is medium acid to very strongly acid.

The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 through 7; and chroma of 1 through 6. It is silty clay loam, silty clay, or clay. Coarse fragment content ranges from 0 to 5 percent. The C horizon ranges from very strongly acid to slightly acid.

Bado series

The Bado series consists of deep, poorly drained soils that have a fragipan at a depth of 18 to 40 inches. Permeability is very slow. These soils are on uplands. They formed in a thin mantle of loess and clayey residuum weathered from cherty limestone under deciduous forest vegetation. Slope ranges from 0 to 2 percent.

Bado soils are similar to Gerald soils and are adjacent to or near Needleye and Viraton soils. Gerald soils have a darker or thicker, dark colored A1 or Ap horizon than Bado soils. Needleye and most Viraton soils are on very gently sloping and gently sloping positions and have more silt and chert and less clay in the subsoil above the fragipan.

Typical pedon from an area of Bado silt loam; 790 feet north and 2,110 feet east of southwest corner of sec. 36, T. 31 N., R. 22 W., Greene County:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak medium and thick platy structure; friable; common fine roots; few worm channels and casts; few fine black concretions of iron and manganese oxides; strongly acid; abrupt smooth boundary.

A2—7 to 12 inches; light brownish gray (10YR 6/2) silt loam; weak thick platy structure; friable; few fine roots; few worm channels and casts; few fine black concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B1t—12 to 16 inches; light brownish gray (10YR 6/2) silty clay loam; few fine faint pale brown mottles;

weak very fine and fine subangular blocky structure; firm; few patchy grayish brown clay films; few fine roots; few worm channels and casts; few fine black concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B2t—16 to 28 inches; dark grayish brown (10YR 4/2) silty clay; few fine distinct dark yellowish brown (10YR 4/4) and gray (10YR 5/1) mottles; weak fine and medium angular blocky structure; very firm; thin continuous clay films; few fine roots; less than 5 percent fine chert fragments; few fine black concretions of iron and manganese oxides; extremely acid; clear wavy boundary.

IIBx1—28 to 43 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct dark gray (10YR 4/1) and gray (10YR 5/1) mottles; massive; brittle; very firm; few patchy dark yellowish brown (10YR 4/4) clay films, flows, and plugs; less than 5 percent fine chert fragments; few fine black concretions of iron and manganese oxides; extremely acid; clear wavy boundary.

IIBx2—43 to 51 inches; mottled yellowish brown (10YR 5/6) and gray (10YR 6/1) cherty silty clay loam; massive; brittle; very firm; thick patchy gray (10YR 5/1) clay films, flows, and plugs; 30 percent fine chert fragments; few fine black concretions of iron and manganese oxides; extremely acid; clear wavy boundary.

IIB21t—51 to 69 inches; mottled yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and yellowish red (5YR 5/6) very cherty silty clay; common medium distinct dark gray (10YR 4/1) and gray (10YR 5/1) mottles; moderate fine angular blocky structure; very firm; thick continuous red, yellow, and brown clay films; 70 percent fine chert; few fine black concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

IIB22t—69 to 76 inches; dark red (2.5YR 3/6) very cherty silty clay; few coarse prominent gray (10YR 5/1) and dark gray (10YR 4/1) mottles; moderate fine and very fine angular blocky structure; very firm; thick dark reddish brown (2.5YR 3/4) clay films; 60 percent fine chert fragments; few fine black concretions of iron and manganese oxides; medium acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Chert content is 0 to about 15 percent in the upper part of the B horizon, 5 to more than 40 percent in the fragipan, and 30 to more than 60 percent in the B horizon below the fragipan.

The A1 or Ap horizon has hue of 10YR, value of 3 through 5, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 through 6, and dominantly chroma of 1 or 2 that ranges to 3. It is medium acid to extremely acid.

The Bt horizon has hue of 10YR or 2.5Y, value of 3 through 6, and dominantly chroma of 2 but ranging to 1. Most mottles are pale brown, dark yellowish brown, gray, or yellowish red. The Bt horizon is silty clay loam, silty clay, or clay. It is strongly acid to extremely acid.

The IIBx horizon generally has hue of 10YR that ranges to 7.5YR and 2.5YR, value of 4 through 6, and chroma of 4 through 6. Mottles have hue and value similar to the matrix but also have chroma of 1 or 2. The IIBx horizon ranges from silt loam to cherty silty clay loam in the upper part. In the lower part, it is cherty silt loam or cherty silty clay loam. The IIBx horizon is strongly acid or extremely acid.

The IIB2t horizon is mottled. It has hue of 10YR through 2.5YR, value of 3 through 6, and chroma of 1 through 6. It has cherty or very cherty analogs of silty clay loam or silty clay. The IIB2t horizon is very strongly acid to medium acid.

Barco series

The Barco series consists of moderately deep, well drained soils on uplands. Permeability is moderate. These soils formed in loamy residuum weathered from acid sandstone that contains thin beds of silty and sandy shale under prairie vegetation. Slope ranges from 2 to 5 percent.

Barco soils are similar to Bolivar soils. They are adjacent to or near Bolivar, Basehor, and Collinsville soils. Basehor and Collinsville soils are on similar or steeper positions than Barco soils and are shallow to sandstone. Basehor and Bolivar soils have a lighter colored or thinner, dark colored A1 or Ap horizon. Basehor soils are stony.

Typical pedon from an area of Barco fine sandy loam, 2 to 5 percent slopes; 1,300 feet north and 50 feet west of southeast corner of sec. 24, T. 27 N., R. 25 W., Lawrence County:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; many roots; many worm channels and casts; slightly acid; clear smooth boundary.

B1—11 to 19 inches; brown (10YR 4/3) and yellowish brown (10YR 5/4 and 5/6) loam; weak fine granular structure and very fine subanguar blocky; friable; common roots; few worm channels and casts; few concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B2t—19 to 25 inches; yellowish brown (10YR 5/4, 5/6, or 5/8) sandy clay loam; few medium prominent yellowish red (5YR 4/6) mottles; weak fine subangular blocky structure; friable; thin patchy clay films; few roots; few worm channels and casts; few concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

B3t—25 to 37 inches; yellowish brown (10YR 5/4) and yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; thick

patchy grayish brown clay films, mostly in vertical pores and cracks or on the surface of sandstone fragments; few fine fragments of sandstone; few concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

Cr—37 to 60 inches; yellowish red and brownish yellow soft weakly stratified sandstone; thin discontinuous lenses of clayey shale; dark gray and grayish brown thick patchy clay films in cracks and pores; very strongly acid.

The thickness of the solum and the depth to soft sandstone are 20 to 40 inches.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. It is dominantly fine sandy loam but ranges to loam. The Ap or A1 horizon is slightly acid to strongly acid.

The B1 horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 3 through 6. It is fine sandy loam, loam, or clay loam. The B2t horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 through 8. It is loam, clay loam, or sandy clay loam. The B2t horizon is very strongly acid to medium acid. Some pedons that have sandstone at a depth of less than 30 inches do not have a B3t horizon.

Basehor series

The Basehor series consists of shallow, well drained, stony soils on uplands. Permeability is moderately rapid. These soils formed in loamy residuum weathered from acid, fine grained sandstone and siltstone under deciduous forest vegetation. Slope ranges from 2 to 14 percent.

Basehor soils are similar to Collinsville soils. They are adjacent to or near Barco, Bolivar, and Collinsville soils. Barco and Bolivar soils are on landscape positions similar to those of Basehor soils and are gently sloping and moderately deep to sandstone. Barco and Collinsville soils have a dark colored or thicker, dark colored A1 or Ap horizon. Collinsville soils are not stony and have a mollic epipedon.

Typical pedon from an area of Basehor stony fine sandy loam, 2 to 14 percent slopes; 1,915 feet north and 20 feet west of southeast corner of sec. 23, T. 28 N., R. 25 W., Lawrence County:

A1—0 to 3 inches; dark brown (10YR 3/3) and brown (10YR 4/3) stony fine sandy loam, brown (10YR 5/3) dry; weak medium platy structure parting to very fine and fine granular; very friable; common fine roots; common worm channels and casts, some casts are brown and yellowish brown; few fine sandstone fragments; few fine concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B21—3 to 6 inches; brown (10YR 4/3 and 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; friable; few fine roots; common worm channels and casts; few fine sandstone fragments; few fine concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

B22—6 to 13 inches; strong brown (7.5YR 5/6) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; common worm channels and casts; few sandstone fragments; few fine concretions of iron and manganese oxides; strongly acid; abrupt smooth boundary.

R—13 inches; yellowish brown hard sandstone bedrock, fractured at 1 foot to 3 feet intervals; weathered fine earth and sandstone fragments in cracks and partings.

The thickness of the solum and the depth to sandstone are 10 to 20 inches. Sandstones 15 to 30 inches long, 8 to 20 inches wide, and 6 to 12 inches thick are spaced 5 to 100 feet apart on the surface of most pedons. Smaller fragments of sandstone, siltstone, and in places chert are on the surface and throughout the soil; coarse fragments in the surface soil are less than 15 percent and in the control section are less than 35 percent. Reaction in most pedons is medium acid or strongly acid.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 2 or 3. An A2 horizon, similar to the A1 horizon, is present in some pedons but moist value ranges to 6 and chroma ranges to 4. The A1 horizon is dominantly stony fine sandy loam but ranges to fine sandy loam.

The B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 6.

Bolivar series

The Bolivar series consists of moderately deep, well drained soils on uplands. Permeability is moderate. These soils formed in residuum weathered from acid sandstone with thin beds of clayey and sandy shale under deciduous forest vegetation. Slope ranges from 2 to 5 percent.

Bolivar soils are similar to Barco soils. They are adjacent to or near Barco, Basehor, and Collinsville soils. Barco, Basehor, and Collinsville soils are on positions similar to those of Bolivar soils, but Basehor and Collinsville soils have a maximum slope gradient of about 14 percent. Barco and Collinsville soils have a darker or thicker, dark colored A1 or Ap horizon. Basehor and Collinsville soils are shallow to sandstone.

Typical pedon from an area of Bolivar fine sandy loam, 2 to 5 percent slopes; 50 feet north and 2,050 feet west of southeast corner of sec. 23, T. 27 N., R. 25 W., Lawrence County:

Ap—0 to 11 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; few fine faint yellowish

brown mottles; weak fine granular structure; very friable; common roots; common worm channels and casts; slightly acid; clear smooth boundary.

B1—11 to 15 inches; strong brown (7.5YR 5/6) loam; moderate fine and very fine granular structure; friable; few roots; few worm channels and casts; few concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

B2t—15 to 23 inches; strong brown (7.5YR 5/6) and reddish brown (5YR 4/4) clay loam; few fine distinct pale brown (10YR 6/3) and faint yellowish red mottles; moderate fine subangular blocky structure; firm; continuous clay films; few roots; few worm channels and casts; few concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

B3t—23 to 32 inches; mottled strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), red (2.5YR 4/6), and light brownish gray (10YR 6/2) sandy clay loam; weak fine and medium subangular blocky structure; friable; thick patchy films; 10 to 15 percent sandstone fragments; few concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

Cr—32 to 60 inches; yellowish red and brownish yellow soft sandstone interbedded with thin discontinuous lenses of shale; sandstone surfaces have thick patchy clay films or flows.

The thickness of the solum and the depth to weathered soft sandstone are 20 to 40 inches.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 through 6, and chroma of 3 or 4. The A horizon is medium acid or slightly acid.

Some eroded or deeply plowed pedons do not have a B1 horizon. The B2t horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 or 5; and chroma of 4 through 8. Some part of the B2t horizon has hue redder than 10YR. The B2t horizon is loam, sandy clay loam, or clay loam, and ranges from medium acid to very strongly acid. Some pedons that have sandstone at a depth of 20 to 30 inches do not have a B3t horizon.

Carytown series

The Carytown series consists of deep, poorly drained soils on uplands and terrace flats and in terrace depressions. Permeability is very slow. These soils formed in sodium-rich, loamy and clayey residuum weathered from shale or old alluvium, colluvium, or loess under prairie and scattered deciduous forest vegetation. Slope ranges from 0 to 2 percent.

Carytown soils are adjacent to or near Creldon, Gerald, Hepler, Parsons, and Sampsel soils. Creldon, Gerald, Parsons, and Sampsel soils are on uplands in positions similar to those of Carytown soils, and Hepler soils are on similar terrace positions. Creldon and Sampsel soils have maximum slope gradients of 4 or 5 percent. The adjacent soils have a dark colored A1 or Ap horizon but do not have a natric horizon. Creldon and Gerald soils have a fragipan.

Typical pedon from an area of Carytown silt loam; 210 feet south and 1,110 feet west of northeast corner of sec. 9, T. 28 N., R. 27 W., Lawrence County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) dry; weak thin platy structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A2—8 to 17 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium platy structure; friable; vesicular; few fine roots; common fine concretions of iron and manganese oxides; medium acid; abrupt wavy boundary.

B21t—17 to 23 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silty clay; common fine prominent dark red (2.5YR 3/6) mottles; moderate fine and very fine angular blocky structure; very firm; in upper 1 to 2 centimeters, peds partially coated with light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) silty material; thick continuous clay films; few fine roots; common fine concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B22t—23 to 29 inches; very dark grayish brown (2.5Y 3/2) clay; few fine faint olive brown and distinct dark yellowish brown (10YR 4/4) mottles; weak fine angular blocky structure; very firm; thick continuous clay films; common slickensides; few fine roots; few fine chert fragments; few concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

B23t—29 to 34 inches; olive brown (2.5Y 4/4) clay; few fine faint very dark grayish brown and distinct dark gray (10YR 4/1) mottles; weak fine and medium angular blocky structure; very firm; thick continuous clay films; common slickensides; few fine chert fragments; common fine concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

B3t—34 to 50 inches; gray (10YR 5/1) and dark gray (10YR 4/1) clay; few medium prominent olive brown (2.5Y 4/4) mottles; weak medium and coarse angular blocky structure; very firm; thick continuous clay films; few fine chert fragments; common fine concretions of iron and manganese oxides; moderately alkaline; gradual smooth boundary.

C—50 to 62 inches; gray (10YR 5/1) and dark gray (10YR 4/1) clay; few fine prominent olive brown (2.5Y 4/4) mottles; massive; very firm; thin patchy clay films; common fine concretions of iron and manganese oxides; few medium and large

accumulations of calcium carbonate; moderately alkaline.

The thickness of the solum ranges from 40 to more than 60 inches. Depth to the B2t horizon ranges from less than 6 inches to about 20 inches and is extremely variable in a short distance in some areas.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. If the A1 or Ap horizon has value of 3, it is less than 6 inches thick. The A2 horizon has hue of 10YR, value of 4 through 6, and chroma of 1 through 3. The A horizon is strongly acid to neutral.

The B2t horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 through 4. The clay content ranges from 40 to 60 percent. The Bt horizon to a depth of 30 inches is medium acid to moderately alkaline. Below this depth it is neutral to strongly alkaline. Calcium concretions and gypsum crystals are at a depth of 40 to 60 inches in many pedons.

Cedargap series

The Cedargap series consists of deep, well drained and somewhat excessively drained soils on the flood plains of small streams. Permeability is moderately rapid. These soils formed in silty and clayey alluvium containing a high percentage of chert fragments under prairie and scattered deciduous forest vegetation. Slope ranges from 0 to 2 percent.

Cedargap soils are adjacent to or near Hepler, Huntington, Lanton, Osage, Secesh, and Waben soils. Hepler, Secesh, and Waben soils are on terraces and do not have a cumulic mollic epipedon. Huntington, Lanton, and Osage soils are on landscape positions similar to those of Cedargap soils but have more silt or clay and less coarse fragments or sand in the control zone than the Cedargap soils. Huntington soils have a mollic epipedon.

Typical pedon from an area of Cedargap silt loam; 1,155 feet north and 1,720 feet east of southwest corner of sec. 23, T. 31 N., R. 22 W., Greene County:

A11—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and very fine granular structure; very friable; many fine roots; common worm channels and casts; few fine chert fragments; medium acid; gradual smooth boundary.

A12—6 to 20 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure and very fine subangular blocky; friable; common fine roots; few worm channels and casts; about 5 percent fine chert fragments; few fine concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

C1—20 to 40 inches; very dark grayish brown (10YR 3/2) very cherty silty clay loam; moderate very fine and fine subangular blocky structure; friable over firm; few fine roots; about 65 percent fine chert fragments; few fine concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

C2—40 to 72 inches; very dark grayish brown (10YR 3/2) very cherty silty clay; moderate fine angular blocky structure; firm; about 70 percent fine chert fragments; few fine concretions of iron and manganese oxides; slightly acid.

The depth to bedrock is more than 40 inches and commonly more than 60 inches. Chert content of the 10- to 40-inch section ranges from 35 percent to about 80 percent. The reaction is medium acid to neutral.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 through 3. It is silt loam, cherty or very cherty silt loam, loam, and cherty or very cherty loam.

The C horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4. It is cherty or very cherty analogs of silt loam, loam, or silty clay loam in the upper part, but the lower part of many pedons is cherty or very cherty silty clay.

Clarksville series

The Clarksville series consists of deep, somewhat excessively drained soils on uplands. Permeability is moderately rapid. These soils formed in loamy and clayey residuum or colluvial-alluvial materials weathered from cherty limestone under deciduous forest vegetation. Slope ranges from 5 to 30 percent.

Clarksville soils are similar to Nixa and Wilderness soils. They are adjacent to or near Goss, Nixa, Viraton, Waben, and Wilderness soils. Goss, Nixa, and Wilderness soils are on landscape positions similar to those of Clarksville soils; however, Goss soils have more clay in the control section than Clarksville soils. Nixa and Wilderness soils have a fragipan. Viraton soils on uplands and terraces and Waben soils on terraces have slope gradients that do not exceed 5 percent. Viraton soils have a fragipan and more silt and less chert in the surface soil and subsoil above the fragipan. Viraton, Waben, and Wilderness soils have a higher base saturation.

Typical pedon of Clarksville cherty silt loam, from an area of Clarksville-Nixa cherty silt loams, 5 to 14 percent slopes; 50 feet south and 550 feet east of northwest corner of sec. 24, T. 26 N., R. 25 W., Lawrence County:

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) cherty silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; many roots; many worm channels and casts; about 30 percent chert fragments; medium acid; clear smooth boundary.

A2—4 to 9 inches; yellowish brown (10YR 5/4) cherty silt loam; weak medium and thick platy structure;

very friable; many fine roots; many worm channels and casts; about 30 percent fine chert fragments; medium acid; clear smooth boundary.

B1—9 to 13 inches; brown (7.5YR 5/4) very cherty silt loam; weak and moderate very fine subangular blocky structure; friable; many roots; common worm channels and casts; about 55 percent chert fragments; medium acid; clear smooth boundary.

B21t—13 to 30 inches; strong brown (7.5YR 5/6) very cherty silty clay loam; common fine distinct pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) mottles; weak and moderate fine subangular blocky structure; firm; patchy clay films; common roots; common worm channels and casts; about 70 percent chert fragments; strongly acid; gradual wavy boundary.

IIB22t—30 to 72 inches; dark red (2.5YR 3/6) very cherty clay; few fine prominent pale brown (10YR 6/3) and pinkish gray (7.5YR 6/2) mottles; moderate fine angular blocky structure; very firm; thick continuous clay films; few roots; about 70 percent chert fragments; in the upper part the chert is coarse, hard, and flinty, but in the lower part about half of the chert is weathered and soft; very strongly acid.

The thickness of the solum ranges from about 60 to more than 100 inches. The chert content in the A horizon ranges from about 20 percent to more than 50 percent and in the B horizon ranges from 35 to 85 percent. The chert is mostly fine, but part of it commonly ranges to coarse.

The A1 horizon has hue of 10YR. It has value and chroma of 2 or 3. The A2 or Ap horizon has hue of 10YR, value of 4 through 6, and chroma of 2 through 4. The A horizon is dominantly cherty silt loam but ranges to cherty or very cherty loam. It is strongly acid or very strongly acid, except in pedons that have been limed.

The upper part of the B2t horizon has hue of 10YR through 2.5YR, value of 4 through 6; and chroma of 4 through 6. It is very cherty analogs of silty clay loam, clay loam, or silt loam. The B2t horizon is medium acid to very strongly acid. The lower part of the B horizon has hue of 7.5YR through 2.5YR, value of 3 through 5, and chroma of 4 through 6. It is very cherty analogs of clay, silty clay, silty clay loam, or silt loam. Reaction is strongly acid or very strongly acid.

Collinsville series

The Collinsville series consists of shallow, well drained and somewhat excessively drained soils on uplands. Permeability is moderately rapid. These soils formed in residuum weathered from sandstone under prairie vegetation. Slope ranges from 2 to 14 percent.

Collinsville soils are similar to Basehor soils. They are adjacent to or near Barco, Basehor, and Bolivar soils. Barco, Basehor, and Bolivar soils are on positions similar to those of Collinsville soils, but Barco and Bolivar soils are gently sloping and moderately deep to sandstone. Basehor and Bolivar soils have a lighter colored or thinner, dark colored A1 or Ap horizon. Basehor soils are stony and do not have a mollic epipedon.

Typical pedon from an area of Collinsville fine sandy loam, 2 to 14 percent slopes; 660 feet north and 2,590 feet east of southwest corner of sec. 22, T. 31 N., R. 24 W., Greene County:

Ap—0 to 10 inches; dark brown (7.5YR 3/2) fine sandy loam, brown (7.5YR 4/2) dry; moderate fine and medium granular structure; very friable; common fine roots; many worm channels and casts; about 10 percent fine sandstone fragments; slightly acid; clear smooth boundary.

C—10 to 13 inches; brown (7.5YR 4/4) gravelly fine sandy loam; massive; very friable; about 30 percent fine soft and hard sandstone fragments; medium acid; abrupt wavy boundary.

R—13 inches; yellowish brown hard sandstone fractured at intervals of 6 to 18 inches; gravelly fine earth is in the cracks and partings.

The thickness of the solum and the depth to sandstone are 4 to 20 inches. Coarse fragments of sandstone and, in places, chert are on the surface and throughout the pedon. Average coarse fragment content is less than 15 percent in the surface soil and less than 35 percent in the control section. Parts of some areas are stony. Reaction is slightly acid to strongly acid.

The A horizon has hue of 10YR, value of 2, and chroma of 2; or it has hue of 10YR or 7.5YR, value of 3, and chroma of 3 or 2.

Most pedons that have bedrock at a depth of more than 15 inches have a B horizon. The B horizon has hue of 10YR, value of 3 or 4, and chroma of 4; hue of 10YR, value of 4, and chroma of 3; or it has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 or 2.

Some pedons do not have a C horizon.

Creldon series

The Creldon series consists of deep, moderately well drained soils on uplands. These soils have a fragipan at a depth of 18 to 36 inches. Permeability is moderate above the fragipan and slow in the fragipan. These soils formed in a thin mantle of loess or other loamy materials and loamy or clayey residuum weathered from cherty limestone under prairie vegetation. Slope ranges from 1 to 4 percent.

Creldon soils are similar to Hoberg soils. They are adjacent to or near Carytown, Eldon, Gerald, Hoberg, Keeno, Newtonia, and Parsons soils. Carytown soils are on uplands and terraces, and Gerald and Parsons soils are on nearly level positions on uplands. Carytown and Parsons soils do not have a fragipan. Gerald soils have more clay and less chert and silt in the subsoil above the

fragipan than Creldon soils. Eldon, Keeno, and Newtonia soils are on positions similar to those of Creldon soils. Eldon and Newtonia soils do not have a fragipan. Hoberg and Keeno soils have less clay and more chert and silt in the subsoil above the fragipan.

Typical pedon from an area of Creldon silt loam, 1 to 4 percent slopes; 900 feet south and 150 feet east of northwest corner of sec. 6, T. 27 N., R. 25 W., Lawrence County:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak to moderate fine and very fine granular structure; very friable; common roots; common worm channels and casts; neutral; abrupt smooth boundary.

B1t—9 to 14 inches; dark brown (10YR 4/3 and 7.5YR 4/4 or 3/2) silty clay loam; few fine distinct yellowish red (5YR 4/6) mottles; moderate very fine and fine subangular blocky structure; friable; thin patchy clay films; few roots; few worm channels and casts; few concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B21t—14 to 19 inches; dark brown (10YR 4/3) silty clay loam; common medium prominent red (2.5YR 4/6) and faint dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) mottles; moderate fine and very fine subangular and angular blocky structure; friable to firm; thin nearly continuous clay films; few roots; few worm channels and casts; few concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B22t—19 to 24 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silty clay loam; common medium prominent red (2.5YR 4/6) and faint light brownish gray (10YR 6/2) mottles; moderate fine and very fine angular blocky structure; firm; thin continuous clay films; few fine chert fragments; many concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

IIBx—24 to 36 inches; mottled red (2.5YR 4/6), grayish brown (10YR 5/2), and dark gray (10YR 4/1) silty clay loam overlying cherty silty clay loam; weak medium and thick platy structure; brittle; firm; thick patchy clay films, flows, or plugs line or fill cracks; few chert fragments in upper part and about 45 percent fine chert in lower part; common concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

IIB21t—36 to 47 inches; dark red (2.5YR 3/6) cherty silty clay; weak to moderate fine and medium angular blocky structure; firm; thick continuous clay films; about 45 percent fine chert fragments; common concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

IIB22t—47 to 67 inches; yellowish brown (10YR 5/4) and dark red (2.5YR 3/6) cherty clay; moderate medium angular blocky structure; very firm; thick continuous clay films; common slickensides; about 15 percent fine chert fragments; many concretions of iron and manganese oxides; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Chert content is 0 to 15 percent in the A horizon and upper part of the B horizon, 0 to 20 percent in the lower part of the B horizon above the fragipan, and 20 to 60 percent in the fragipan and below.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. It is neutral to very strongly acid.

The B2t horizon has hue of 10YR, 7.5YR, and 5YR; value of 3 through 5; and chroma of 3 through 6. The upper 10 inches of the Bt horizon in some pedons have mottles with chroma of 2 or less and value of 4 or more. The Bt horizon is dominantly silty clay loam or silty clay, but in some pedons the IIB2t horizon is cherty silty clay loam or cherty silty clay. It is slightly acid to very strongly acid.

The IIBx horizon is mottled. In the upper part, it ranges from silt loam to cherty silty clay loam. The lower part is silty clay loam or cherty silty clay loam. The IIBx horizon is very strongly acid or extremely acid.

The IIB2t horizon has hue of 2.5YR, value of 3 or 4, and chroma of 6 to 8. Mottling is similar to that in the fragipan. The IIB2t horizon is cherty analogs of clay, silty clay, silty clay loam, or clay loam. It is medium acid to very strongly acid.

Eldon series

The Eldon series consists of deep, well drained soils on uplands. Permeability is moderate. These soils formed in loamy and clayey, cherty limestone residuum. Slope ranges from 2 to 14 percent.

Eldon soils are similar to Goss soils. They are adjacent to or near Creldon, Gasconade, Newtonia, and Pembroke soils. Creldon and Newtonia soils are on positions similar to those of Eldon soils, and Pembroke soils are on gently sloping uplands or terraces. Creldon soils have a fragipan. Creldon, Newtonia, and Pembroke soils have more silt and less clay and chert in the control section than Eldon soils. Gasconade soils are on upland slope breaks and are shallow to bedrock. Goss soils have a lighter colored or thinner, dark colored A1 or Ap horizon.

Typical pedon from an area of Eldon cherty silt loam, 5 to 14 percent slopes; 1,930 feet north and 290 feet east of southwest corner of sec. 16, T. 28 N., R. 23 W., Greene County:

Ap—0 to 10 inches; dark brown (7.5YR 3/2) cherty silt loam, brown (7.5YR 5/2) dry; moderate fine granular structure; very friable; common fine roots; few worm channels and casts; about 20 percent fine chert fragments; medium acid; clear smooth boundary.

B21t—10 to 19 inches; reddish brown (5YR 4/4) very cherty silty clay loam; moderate very fine subangular

blocky structure; friable; few fine roots; few worm channels and casts; thin patchy clay films; about 60 percent fine chert fragments; few fine concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B22t—19 to 24 inches; reddish brown (2.5YR 4/4) very cherty silty clay loam; moderate fine and very fine subangular blocky structure; firm; few fine roots; patchy clay films; about 70 percent fine chert fragments; few fine concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B23t—24 to 31 inches; dark red (2.5YR 3/6) very cherty silty clay; few medium faint dusky red mottles; strong fine angular blocky structure; firm; few fine roots; patchy clay films; about 60 percent fine and coarse chert fragments; few fine concretions of iron and manganese oxides; strongly acid; gradual wavy boundary.

IIB2t—31 to 72 inches; dusky red (10R 3/4) clay; moderate medium angular blocky structure; very firm; thick continuous clay films; about 10 percent fine chert fragments, some of which are soft and weathered; few concretions of iron and manganese oxides; strongly acid.

The depth to limestone bedrock and the thickness of the solum are more than 60 inches. Some pedons are stony.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. Chert content ranges from 10 to 35 percent. Unlimed pedons are medium acid or strongly acid.

Some pedons have a B1 horizon. The B2t horizon has hue of 5YR, 2.5YR, or 10R; value of 3 or 4; and chroma of 3 through 6. It is silty clay loam, silty clay, or clay, and chert content ranges from 35 to 75 percent. The B2t horizon is very strongly acid to medium acid. The IIB2t horizon has colors similar to those of the B2t horizon. Chert content ranges from 5 to 50 percent. The IIB2t horizon is very strongly acid to slightly acid.

Freeburg series

The Freeburg series consists of deep, somewhat poorly drained soils on terraces of small streams. Permeability is moderately slow. These soils formed in old alluvial and colluvial materials washed from nearby uplands under deciduous forest vegetation. Slope ranges from 2 to 9 percent.

Freeburg soils are adjacent to or near Alsup, Peridge, and Sampsel soils. Alsup and Sampsel soils are on uplands and have more clay and less silt in the control section than Freeburg soils. Sampsel soils have a mollic epipedon. Peridge soils are on upland and terrace positions and do not have low chroma mottles in the upper 10 inches of the control section.

Typical pedon of Freeburg silt loam, from an area of Freeburg and Alsup silt loams, 2 to 9 percent slopes; 1,150 feet north and 1,520 feet east of southwest corner of sec. 30, T. 31 N., R. 21 W., Greene County:

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; common roots; common worm channels and casts; slightly acid; clear smooth boundary.

A2—2 to 10 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak thin and medium platy structure; very friable; common roots; common worm channels and casts; medium acid; clear smooth boundary.

B1—10 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; friable; common worm channels; common brown and grayish brown worm casts; medium acid; clear smooth boundary.

B21t—13 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint brown and pale brown mottles; moderate fine and very fine subangular blocky structure; firm; thin patchy clay films; few roots; few worm channels; strongly acid; clear smooth boundary.

B22t—18 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate and weak fine subangular blocky structure; firm; thin patchy clay films; strongly acid; clear smooth boundary.

B23t—23 to 34 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), light gray (10YR 7/2), and pale brown (10YR 6/3) silty clay loam; moderate and weak fine subangular blocky structure; firm; thin patchy black and dark brown clay films; about 2 percent fine chert fragments; common splotches of dark concretionary material; very strongly acid; gradual smooth boundary.

B31t—34 to 48 inches; mottled light brownish gray (10YR 6/2), brown (10YR 5/3), yellowish brown (10YR 5/4), and dark gray (10YR 4/1) silty clay loam; weak medium subangular blocky structure; friable; patchy black and dark brown clay films; about 2 percent fine chert fragments; many splotches of dark concretionary material; slightly acid; gradual smooth boundary.

B32t—48 to 72 inches; mottled light gray (10YR 7/2 to 7/1) and yellowish brown (10YR 5/6 to 5/4) silty clay loam; weak medium subangular blocky structure; friable; patchy black and dark brown clay films; common splotches of dark concretionary material; about 12 percent fine chert gravel; slightly acid.

The thickness of the solum ranges from about 35 inches to more than 60 inches. Reaction ranges from neutral in the A horizon to very strongly acid in the lower part of the B horizon. The coarse fragment content is less than 2 percent in the A and B2t horizons and is 1 to 15 percent in the B3t horizon.

The Ap and A2 horizons have hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A1 horizon is 1 to 5 inches thick and has hue of 10YR, value of 2 through 4, and chroma of 2 or 3. The A horizon is silt loam or loam.

The upper part of the B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 through 6. The lower part of the B2t horizon has hue of 10YR, value of 4 through 6, and chroma of 1 through 6. Commonly the B2t horizon is mottled by a mixture of these colors and a high percentage of colors with chroma of 2 or less. The B2t horizon is silty clay loam or clay loam. Some pedons have a C horizon.

Gasconade series

The Gasconade series consists of shallow, somewhat excessively drained soils on uplands. Permeability is moderately slow. These soils formed in clayey residuum weathered from cherty limestone under native grasses and trees. Slope ranges from 2 to 50 percent.

Gasconade soils are adjacent to or near Eldon, Goss, Pembroke, and Sampsel soils. All of these soils are on uplands, but some Pembroke soils are on gently sloping terraces. All of the associated soils are deep to bedrock.

Typical pedon of Gasconade flaggy clay loam, from an area of Gasconade-Rock outcrop complex, 2 to 20 percent slopes; 1,980 feet north and 1,280 feet east of southwest corner of sec. 33, T. 31 N., R. 24 W., Greene County:

A1—0 to 7 inches; very dark brown (10YR 2/2) flaggy clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine and very fine granular structure; friable; common fine roots; common worm channels and casts; about 20 percent limestone flags and 15 percent chert fragments; slightly acid; clear smooth boundary.

B2—7 to 15 inches; dark brown (7.5YR 3/2) flaggy silty clay; moderate fine and very fine subangular and angular blocky structure; firm; common fine roots; about 20 percent limestone flags and 15 percent chert fragments; slightly acid; abrupt irregular boundary.

R—15 to 20 inches; limestone bedrock, fractured at irregular intervals; cracks and partings are filled with clayey material.

The thickness of the solum and the depth to bedrock are 4 to 20 inches. Limestone fragments, some chert, and other coarse fragments are on the surface and throughout the pedon. Coarse fragment content of the control section ranges from 35 to 70 percent. Reaction ranges from slightly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam, silty clay, clay loam, or flaggy analogs of these textures.

The B horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 through 4. It is the flaggy analogs of clay, silty clay, or clay loam. Some pedons do not have a B horizon.

Gerald series

The Gerald series consists of deep, somewhat poorly drained soils on uplands. Permeability is very slow. These soils have a fragipan at a depth of 18 to 40 inches. They formed in a thin mantle of loess or other loamy material and clayey residuum weathered from cherty limestone under prairie vegetation. Slope ranges from 0 to 2 percent.

Gerald soils are similar to Bado soils. They are adjacent to or near Carytown, Creldon, Hoberg, Keeno, and Parsons soils. Creldon, Keeno, Parsons, Carytown, and Hoberg soils are on landscape positions similar to those of Gerald soils, but Carytown and Hoberg soils are also on terraces. Bado and Carytown soils have an ochric epipedon. Carytown and Parsons soils do not have a fragipan. Creldon, Hoberg, and Keeno soils have less clay than Gerald soils and have more chert and silt in the subsoil above the fragipan.

Typical pedon from an area of Gerald silt loam; 2,440 feet south and 1,850 feet east of northwest corner of sec. 4, T. 27 N., R. 27 W., Lawrence County:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; common fine roots; common worm channels and casts; less than 5 percent chert fragments; few fine dark concretions of iron and manganese oxides; strongly acid; abrupt smooth boundary.

A2—8 to 12 inches; grayish brown (10YR 5/2) silt loam; moderate medium and thin platy structure; friable; few fine roots; common worm channels and casts; less than 5 percent fine chert fragments; common fine dark concretions of iron and manganese oxides; strongly acid; abrupt smooth boundary.

B21t—12 to 16 inches; dark brown (7.5YR 4/2) silty clay; common medium distinct dark reddish brown (5YR 3/4) mottles; grayish brown (10YR 5/2) patchy silt coats on faces of peds; moderate very fine and fine angular blocky structure; very firm; dark brown (7.5YR 3/2) thick continuous clay films; few fine roots; few worm channels and casts; less than 5 percent fine chert fragments; common fine dark concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B22t—16 to 24 inches; dark brown (7.5YR 3/2) clay; many medium distinct dark reddish brown (5YR 3/4) mottles; moderate and weak thick prismatic structure separating to medium and coarse angular blocky; very firm; dark brown (7.5YR 4/2 and 3/2) thick continuous clay films; few fine roots; less than 5 percent chert fragments; few fine dark concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

IIBx1—24 to 33 inches; mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4 to 5/6) silt loam; few fine distinct dark brown (7.5YR 4/4) and dark gray (10YR 4/1) mottles; weak and moderate thick platy structure; brittle; firm; dark gray (10YR 4/1) patchy clay films; about 10 percent chert fragments; few fine concretions of iron and manganese oxides; very strongly acid; gradual wavy boundary.

IIBx2—33 to 44 inches; mottled red (2.5YR 4/6), light brownish gray (10YR 6/2), and light gray (10YR 6/1) cherty silty clay loam; few fine faint yellowish red (5YR 4/6), dark brown (7.5YR 4/2), and distinct dark gray (10YR 4/1) mottles; weak thick platy structure; brittle; firm; dark brown (7.5YR 4/2) and dark gray (10YR 4/1) thick patchy clay films; about 20 percent chert fragments; few fine concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

IIB2t—44 to 72 inches; dark red (2.5YR 3/6) very cherty clay; common fine prominent light gray (10YR 6/1) and light brownish gray (10YR 6/2) mottles; moderate fine and medium angular blocky structure; very firm; dark red (2.5YR 3/6) thick discontinuous clay films; about 55 percent chert fragments; few fine concretions of iron and manganese oxides; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The chert content, by volume, of the upper part of the B horizon is less than 5 percent to about 15 percent. The average chert content of the fragipan ranges from 5 percent to 50 percent, and chert content of the B horizon below the fragipan is 15 to 75 percent.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma that is commonly 2 but ranges to 1. The A2 horizon has hue similar to the A1 horizon, value of 4 through 6, and chroma of 2 or 1. The A horizon is silt loam. It is medium acid to very strongly acid.

A thin, silty clay loam B1t horizon is in some pedons. The Bt horizon is mottled and has hue of 10YR, 7.5YR, or 5YR; value of 2 through 5; and chroma of 1 or 2. It is silty clay, clay, or heavy silty clay loam and is strongly acid or very strongly acid.

The IIBx2 horizon is mottled. It is silt loam or silty clay loam or their cherty analogs and is very strongly acid. A IIAx horizon is in some pedons.

The IIB2t horizon is cherty or very cherty silty clay loam, silty clay, or clay. It is strongly acid or very strongly acid.

Goss series

The Goss series consists of deep, well drained soils on uplands. Permeability is moderate. These soils formed in loamy and clayey residuum weathered from cherty limestone and dolomite under deciduous forest vegetation. Slope ranges from 2 to 20 percent.

Goss soils are similar to Eldon soils. They are adjacent to or near Alsup, Clarksville, Gasconade, Peridge, Viraton, and Wilderness soils. Alsup, Clarksville, Wilderness, Gasconade, Viraton, and Peridge soils are on upland positions similar to those of Goss soils, but Viraton and Peridge soils are also on terraces. Alsup soils have less coarse fragments than Goss soils, Clarksville soils have less clay, and Peridge soils have less coarse fragments and clay. Eldon soils have a darker or thicker, dark colored surface layer. Gasconade soils are on slope breaks and are shallow to bedrock. Viraton and Wilderness soils have a fragipan.

Typical pedon from an area of Goss cherty silt loam, 5 to 14 percent slopes; 310 feet north and 1,365 feet east of southwest corner of sec. 31, T. 31 N., R. 21 W., Greene County:

A1—0 to 8 inches; dark grayish brown (10YR 4/2) cherty silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; very friable; many roots; about 15 percent chert fragments; neutral; clear smooth boundary.

B1t—8 to 12 inches; yellowish red (5YR 5/8) cherty silty clay loam; moderate fine subangular blocky structure; friable; common roots; about 35 percent chert fragments; medium acid; clear smooth boundary.

B21t—12 to 20 inches; yellowish red (5YR 5/8) cherty silty clay loam; moderate fine angular and subangular blocky structure; firm; thin almost continuous clay films; common roots; about 45 percent chert fragments; very strongly acid; clear smooth boundary.

B22t—20 to 40 inches; red (2.5YR 4/6) cherty silty clay; common medium distinct yellowish red (5YR 4/6) and faint dark red (2.5YR 3/6) mottles; moderate fine and medium angular blocky structure; firm; discontinuous clay films; few roots; about 45 percent chert fragments; very strongly acid; gradual smooth boundary.

B23t—40 to 72 inches; dark red (2.5YR 3/6) cherty clay; common medium prominent pale brown (10YR 6/3) mottles; moderate fine and medium angular blocky structure; very firm; thick continuous clay films; about 45 percent chert fragments; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 through 4. The Ap horizon has hue of 10YR, 5YR, or 7.5YR; value of 4 through 6; and chroma of 2 through 4. Chert content of the A horizon ranges from 10 to 35 percent. The A horizon is medium acid to neutral.

The upper part of the B2t horizon has hue of 7.5YR, 5YR, or 2.5YR; value of 4 or 5; and chroma of 4 through

8. It is cherty silty clay loam or cherty silty clay. The lower part of the B2t horizon is dominantly dark red (2.5YR 3/6) cherty clay. Below the control section the average chert content is 45 to 60 percent, but individual horizons can be relatively chert free. The Bt horizon ranges from neutral to medium acid in the upper part and from very strongly acid to medium acid in the lower part.

Most pedons do not have a C horizon at a depth of less than 72 inches.

Hepler series

The Hepler series consists of deep, somewhat poorly drained soils on low stream terraces. Permeability is moderately slow. These soils formed in silty alluvial sediment under deciduous forest vegetation. Slope ranges from 0 to 2 percent.

Hepler soils are adjacent to or near Carytown, Cedargap, Huntington, Lanton, Osage, and Sampsel soils. Cedargap, Huntington, Lanton, and Osage soils are on flood plains. Except for Huntington soils, these soils have a cumulic mollic epipedon. Huntington soils have a mollic epipedon but do not have a matrix of low chroma or mottles at a depth of less than 20 inches. Carytown soils are on uplands and terraces and have an ochric epipedon and a natric horizon. Sampsel soils are on uplands and have a mollic epipedon. They have more clay than Hepler soils and have less silt in the control zone.

Typical pedon from an area of Hepler silt loam; 1,730 feet north and 2,550 feet west of southeast corner of sec. 13, T. 28 N., R. 28 W., Lawrence County:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; few roots; few fine concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

A2—8 to 20 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium and thin platy structure; friable; few roots; few fine concretions of iron and manganese oxides; medium acid; gradual smooth boundary.

B1t—20 to 30 inches; grayish brown (10YR 5/2) silt loam; common fine and medium faint light brownish gray (10YR 6/2) mottles and few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; thin patchy clay films; common light brownish gray silt coats on faces of peds; few roots; common fine concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

B2t—30 to 49 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and light brownish gray (10YR 6/2) mottles and common fine distinct dark yellowish brown (10YR 4/4) and dark brown (10YR 3/3) mottles; weak fine and medium subangular blocky structure; firm; thin patchy clay films, many fine concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

B3—49 to 65 inches; mottled grayish brown (10YR 5/2), dark brown (10YR 4/3), light brownish gray (10YR 6/2), and dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; firm; many fine concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

The thickness of the solum is more than 40 inches and commonly more than 60 inches. The depth to bedrock is more than 60 inches. Depth to the lower boundary of the A horizon is more than 20 inches in some pedons.

The A1 or Ap horizon has hue of 10YR, value of 3 or less, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The upper part of the A horizon is slightly acid to strongly acid, and the lower part is medium acid to very strongly acid.

Some pedons have a B1t horizon. It is similar to the A2 horizon in color and reaction. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The lower part of the B horizon ranges to silty clay in some pedons. The B2t horizon is strongly acid or very strongly acid.

Hoberg series

The Hoberg series consists of deep, moderately well drained soils on uplands and terraces. These soils have a fragipan at a depth of 16 to 36 inches. Permeability is moderate above the fragipan and slow in the fragipan. These soils formed in a thin mantle of loess and loamy or clayey residuum weathered from cherty limestone under prairie vegetation. Slope ranges from 2 to 5 percent.

Hoberg soils are similar to Creldon and Viraton soils. They are adjacent to or near Creldon, Gerald, Keeno, Newtonia, and Pembroke soils. Pembroke soils are on upland and terrace positions similar to those of Hoberg soils. The other soils are on steeper upland positions. Creldon and Gerald soils contain less chert and more clay in the subsoil above the fragipan than Hoberg soils, and Keeno soils contain less silt and chert. Newtonia and Pembroke soils do not have a fragipan. Viraton soils have an ochric epipedon.

Typical pedon from an area of Hoberg silt loam, 2 to 5 percent slopes; 1,500 feet north and 1,170 feet west of southeast corner of sec. 31, T. 28 N., R. 27 W., Lawrence County:

Ap—0 to 7 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate very fine and fine granular structure; very friable; common worm channels and casts; many fine grass roots; 5

percent chert fragments; slightly acid; clear smooth boundary.

B1t—7 to 13 inches; dark brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; friable; common worm channels and casts; many fine grass roots; 5 percent chert fragments; slightly acid; clear smooth boundary.

B2t—13 to 22 inches; reddish brown (5YR 4/4) silty clay loam; moderate and strong fine and very fine subangular blocky structure; friable; thin patchy clay films; common worm channels and casts; common fine roots; about 8 percent chert fragments; medium acid; clear wavy boundary.

IIBx—22 to 47 inches; mottled reddish brown (5YR 4/4), light brown (7.5YR 6/4), and pinkish gray (5YR 6/2 and 7.5YR 6/2) very cherty silty clay loam; massive; brittle; firm; thick patchy clay films; few very fine roots in top few inches; about 75 percent chert fragments; extremely acid; gradual wavy boundary.

IIB2t—47 to 72 inches; dark red (2.5YR 3/6) and dark reddish brown (2.5YR 3/4) very cherty clay, few fine prominent light brown (7.5YR 6/4) mottles; moderate fine angular blocky structure; very firm; thick continuous clay films; about 70 percent chert fragments; few fine concretions of iron and manganese oxides; strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Chert content, by volume, ranges from 0 to 15 percent in the A horizon and upper part of the B horizon; from 5 to 45 percent just above the fragipan; and from 15 to 80 percent within and below the fragipan. Reaction is slightly acid to very strongly acid above the fragipan, very strongly acid or extremely acid in the fragipan, and very strongly acid to medium acid below the fragipan.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. It is silt loam or loam.

The Bt horizon has hue of 7.5YR, 5YR, and 10YR; value of 3 to 5; and chroma of 3 to 6. It is silt loam, silty clay loam, clay loam, cherty silty clay loam, or cherty clay loam.

The IIBx horizon has hue of 7.5YR to 2.5YR, value of 4 through 6, and chroma of 4 through 6. Mottles are of low chroma and have hue of 7.5YR or 5YR and value of 6 or 7. The IIBx horizon is cherty or very cherty phases of silty clay loam, silt loam, or loam.

A IIB2t horizon is in most pedons. It has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 through 6. The IIB2t horizon ranges from cherty or very cherty clay to cherty or very cherty silty clay loam.

Huntington series

The Huntington series consists of deep, well drained soils on flood plains. Permeability is moderate. These soils formed in alluvium washed from soils formed in residuum weathered from cherty limestone, sandstone, and shale under deciduous forest vegetation. Slope ranges from 0 to 2 percent.

Huntington soils are mainly adjacent to or near Cedargap, Hepler, and Lanton soils but to a lesser degree, are near or adjacent to Osage, Secesh, and Waben soils. Cedargap, Lanton, and Osage soils are on landscape positions similar to those of Huntington soils and have a cumulic mollic epipedon. Hepler, Secesh, and Waben soils are on terraces. Cedargap, Secesh, and Waben soils have less silt and more chert or gravel throughout than Huntington soils. Osage soils have less silt and more clay in the control section, and Lanton and Hepler soils are grayer.

Typical pedon from an area of Huntington silt loam; 300 feet south and 1,780 feet west of northeast corner of sec. 25, T. 27 N., R. 27 W., Lawrence County:

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; very friable; common fine roots; common worm channels and casts; neutral; clear smooth boundary.

B1—12 to 25 inches; brown (7.5YR 4/4) silt loam; some faces of peds very dark grayish brown (10YR 3/2); weak very fine subangular blocky and medium granular structure; friable; few fine roots; common worm channels and casts; slightly acid; gradual smooth boundary.

B2—25 to 48 inches; brown (7.5YR 4/4) silt loam; some faces of peds dark brown (10YR 3/3); weak fine and medium subangular blocky structure; friable; common worm channels and casts; medium acid; gradual smooth boundary.

C—48 to 60 inches; brown (7.5YR 4/4) and dark brown (10YR 3/3) silt loam; few to common fine distinct dark grayish brown (10YR 4/2) mottles; massive; friable; few worm channels and casts; most worm casts and some channel linings dark grayish brown; trace of very fine chert pebbles; medium acid.

The thickness of the solum and the depth to unconforming gravelly layers are more than 40 inches and commonly more than 60 inches. Reaction ranges from neutral to medium acid. Coarse fragment content ranges from about 1 percent to as much as 5 percent.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. It is silt loam or loam.

Some pedons do not have a B1 horizon. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Faces of peds commonly have value of 3. The B2 horizon is silt loam or silty clay loam.

The C horizon has colors similar to those of the B horizon. Some pedons do not have low chroma mottles. The C horizon is silt loam, loam, silty clay loam, or clay loam. Thin strata of fine chert gravel and sand are in some pedons.

Keeno series

The Keeno series consists of deep, moderately well drained soils on uplands. These soils have a fragipan at a depth of 18 to 36 inches. Permeability is moderately rapid above the fragipan and slow in the fragipan. These soils formed in residuum weathered from cherty limestone under prairie vegetation. Slope ranges from 2 to 9 percent.

Keeno soils are adjacent to or near Creldon, Gerald, Hoberg, Newtonia, and Pembroke soils. Creldon, Eldon, Gerald, Newtonia, Hoberg, and Pembroke soils are on upland positions similar to those of Keeno soils. Hoberg and Pembroke soils are also on terraces and have slope gradient ranging from about 2 to 5 percent. Creldon, Gerald, and Hoberg soils contain more clay or silt and less chert in the subsoil above the fragipan than Keeno soils. Eldon, Newtonia, and Pembroke soils do not have a fragipan.

Typical pedon from an area of Keeno cherty silt loam, 2 to 9 slopes; 2,620 feet north of center of sec. 5, T. 27 N., R. 27 W., Lawrence County:

A1—0 to 17 inches; dark brown (10YR 3/3) cherty silt loam, brown (10YR 5/3) dry; moderate very fine granular structure; common fine roots; about 20 percent fine chert fragments; very strongly acid; clear smooth boundary.

B1—17 to 22 inches; dark brown (7.5YR 3/2) very cherty silt loam; moderate very fine subangular blocky and granular structure; friable; few clean sand grains; common fine roots; about 50 percent, mostly fine, chert fragments; extremely acid; clear smooth boundary.

B2t—22 to 30 inches; dark brown (7.5YR 4/4) very cherty silty clay loam; common fine distinct reddish brown (5YR 5/4) mottles; moderate very fine and fine subangular blocky structure; friable; few thin patchy clay films; few fine roots; about 55 percent chert fragments; very strongly acid; clear wavy boundary.

A2x—30 to 37 inches; pale brown (10YR 6/3) very cherty silt loam; common medium prominent reddish brown (5YR 4/4) and distinct dark brown (10YR 3/3) mottles and few fine distinct light gray (10YR 7/2) and light brown (7.5YR 6/4) mottles; weak medium platy structure; brittle; firm; dark brown (7.5YR 3/2) thick patchy clay films; about 70 percent chert fragments; few fine concretions of iron and manganese oxides; very strongly acid; gradual wavy boundary.

Bx—37 to 45 inches; reddish brown (5YR 4/4) very cherty silt loam; common medium prominent light brown (10YR 6/4) and pale brown (10YR 6/3) mottles and few fine prominent light gray (10YR 7/1) and distinct yellowish red (5YR 5/6) mottles; weak medium platy structure; firm; brittle; thick patchy clay films; few fine dark concretions of iron and manganese oxides; about 70 percent soft fine chert; extremely acid; clear wavy boundary.

IIB2t—45 to 72 inches; dark red (2.5YR 3/6) very cherty clay; moderate very fine and fine angular blocky structure; very firm; about 70 percent chert fragments, some of which are in discontinuous horizontal beds; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 3 through 5 dry, and chroma of 2 or 3. It is cherty silt loam or cherty loam and is very strongly acid to neutral. Chert content ranges from 15 to 50 percent by volume.

The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 3 through 5; and chroma of 3 through 8. It is cherty or very cherty phases of silty clay loam or clay loam. Chert content is 35 to 80 percent by volume. The B2t horizon is medium acid to very strongly acid.

The A2x and Bx horizons are mottled; however, the A2x horizon is not in some pedons. These horizons are very cherty silt loam, silty clay loam, or clay loam. Chert content is 35 to 80 percent. Reaction is very strongly acid or extremely acid.

The IIB2t horizon is clay, silty clay, or silty clay loam or cherty to very cherty analogs of these textures. This horizon is very strongly acid or strongly acid.

Lanton series

The Lanton series consists of deep, somewhat poorly drained soils on flood plains, along drainageways, and in depressions. Permeability is moderately slow. These soils formed in loamy and clayey alluvium under deciduous forest and marsh or prairiegrass vegetation. Slope ranges from 0 to 2 percent.

The Lanton soils are adjacent to or near Cedargap, Hepler, Huntington, Osage, and Secesh soils. Cedargap, Huntington, and Osage soils are on flood plains, and Hepler and Secesh soils are on terraces. Cedargap and Secesh soils have less silt and more coarse fragments in the control section than Lanton soils, and Osage soils contain less silt and more clay. Hepler, Huntington, and Secesh soils do not have a cumulic mollic epipedon.

Typical pedon from an area of Lanton silt loam; 1,765 feet south and 2,075 feet east of northwest corner of sec. 18, T. 27 N., R. 25 W., Lawrence County:

A11—0 to 10 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate very fine and fine granular structure; friable; many fine roots; common worm channels and casts; few concretions of iron and manganese oxides; neutral; clear smooth boundary.

A12—10 to 16 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine and medium granular structure; friable; common fine roots; common worm

channels and casts; few concretions of iron and manganese oxides; neutral; clear smooth boundary.
A13—16 to 29 inches; very dark gray (10YR 3/1) silty clay loam; common fine faint dark gray (10YR 4/1), dark grayish brown (10YR 4/2), and distinct dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; common fine roots; few worm channels; common concretions of iron and manganese oxides; neutral; clear smooth boundary.
C1g—29 to 43 inches; dark gray (10YR 4/1) and grayish brown (10YR 5/2) silty clay loam; common medium faint very dark gray (10YR 3/1) and few distinct strong brown (7.5YR 5/6) mottles; weak and moderate medium and coarse subangular blocky structure; firm; common fine roots; few worm channels and casts; common concretions of iron and manganese oxides; neutral; gradual smooth boundary.
C2g—43 to 63 inches; gray (10YR 5/1) and strong brown (7.5YR 5/6) silty clay loam; few fine distinct very dark gray (10YR 3/1) mottles; massive; firm; few fine chert pebbles; many strong brown soft iron and manganese oxides; neutral.

The depth to bedrock is more than 60 inches. Reaction is slightly acid or neutral. The mollic epipedon is 24 to more than 30 inches thick.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. In some pedons, the Ap horizon is dark brown (10YR 3/3). The A horizon is silt loam and silty clay loam.

The Cg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2 or is neutral. It is dominantly dark gray (10YR 4/1), but in most pedons it is mottled in shades of brown, gray, and yellow. The Cg horizon is silty clay loam, silty clay, or clay. In some pedons, the lower part of this horizon has 0 to 15 percent coarse fragments.

Needleye series

The Needleye series consists of deep, moderately well drained soils on uplands. Permeability is slow. These soils have a fragipan at a depth of 18 to 36 inches. They formed in a thin mantle of loess or other loamy material and clayey residuum weathered from cherty limestone under deciduous forest vegetation. Slope ranges from 1 to 3 percent.

Needleye soils are adjacent to Bado, Viraton, and Wilderness soils. Bado, Wilderness, and Viraton soils are on upland positions similar to those of Needleye soils. Bado soils have more clay in the subsoil above the fragipan than Needleye soils. Viraton soils contain more than 10 percent chert, and Wilderness soils contain more than 35 percent.

Typical pedon from an area of Needleye silt loam, 1 to 3 percent slopes; 1,285 feet south and 660 feet west of northeast corner of sec. 28, T. 30 N., R. 20 W., Greene County:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) and pale brown (10YR 6/3) dry; moderate fine and very fine granular structure; friable; common fine roots; few worm channels and casts; about 5 percent chert fragments; common fine concretions of iron and manganese oxides; neutral; abrupt smooth boundary.
B1t—7 to 11 inches; brown (7.5YR 5/4) silty clay loam; moderate very fine subangular blocky structure; friable; thin patchy clay films; few fine roots; few worm channels and casts; about 5 percent chert fragments; common fine dark concretions of iron and manganese oxides; strongly acid; clear smooth boundary.
B21t—11 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine and very fine subangular blocky structure; firm; thin discontinuous clay films; few fine roots; about 5 percent chert fragments; strongly acid; clear smooth boundary.
B22t—16 to 21 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay loam; common medium prominent yellowish red (5YR 4/6) mottles; moderate fine subangular and angular blocky structure; firm; thin continuous clay films; about 5 percent chert fragments; strongly acid; clear smooth boundary.
B23t—21 to 29 inches; light gray (10YR 6/1) and dark gray (10YR 4/1) silty clay loam; common medium and fine distinct yellowish brown (10YR 5/4), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) mottles; weak coarse medium and thin platy structure parting to fine subangular and moderate very fine angular blocky; thick dark gray (10YR 4/1) continuous clay films; thick clay flows on many horizontal faces of peds; about 10 percent chert fragments; strongly acid; clear wavy boundary.
IIBx—29 to 38 inches; yellowish brown (10YR 5/4) and brown (10YR 5/3) very cherty silty clay loam; common medium distinct light brownish gray (10YR 6/2), grayish brown (10YR 5/2), and prominent yellowish red (5YR 4/6) mottles; massive; brittle; firm; thick patchy clay films on chert fragments; about 65 percent chert fragments; very strongly acid; clear wavy boundary.
IIB2t—38 to 72 inches; dark red (2.5YR 3/6) and red (2.5YR 4/6) cherty clay; common medium and coarse prominent light gray (10YR 6/1) mottles; moderate fine angular blocky structure; very firm; thick continuous clay films; about 35 percent chert fragments; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The A horizon and upper part

of the B horizon contain less than 5 percent chert, and the lower part of the B horizon above the fragipan contains 0 to 20 percent chert. Chert content in the fragipan ranges from less than 10 percent to 70 percent. Below the fragipan the average chert content ranges from 10 to 50 percent.

The A horizon has hue of 10YR or 7.5YR and value of 3 through 5. Chroma is mainly 2 but ranges to 4 in some pedons. Where the A horizon is less than 6 inches thick, value is 3 or less. The A horizon is medium acid to very strongly acid if it has not been limed.

The upper part of the Bt horizon above the fragipan has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. Low chroma mottles are in the upper 10 inches. The lower part of this horizon has hue of 10YR, value of 4 through 6, and chroma of 1 or 2. Many high chroma mottles ranging from dark yellowish brown (10YR 4/4) to yellowish red (5YR 5/8) are present. The Bt horizon is silty clay loam in the upper part and in most of the lower part above the fragipan. In some pedons, a thin cherty silty clay loam B23t horizon is above the fragipan.

The IIBx horizon is mottled. Hue ranges from 10YR to 2.5YR, value from 2 to 7, and chroma from 1 to 8. The IIBx horizon is cherty or very cherty silty clay loam, cherty or very cherty silt loam, silty clay loam, or silt loam. It is very strongly acid or extremely acid.

The IIB2t horizon has hue of 2.5YR or 5YR, value of 3 through 5, and chroma of 4 through 6. It is dominantly cherty clay but ranges to cherty silty clay loam or silty clay loam and is medium acid to very strongly acid.

Newtonia series

The Newtonia series consists of deep, well drained soils on uplands. Permeability is moderate. These soils formed in residuum or a thin mantle of loess or other loamy materials and residuum weathered from limestone under prairie vegetation. Slope ranges from 1 to 3 percent.

Newtonia soils are similar to Pembroke and Peridge soils. They are adjacent to or near Creldon, Eldon, Hoberg, Keeno, Pembroke, and Peridge soils. Creldon, Eldon, Keeno, and Hoberg soils are on upland positions similar to those of Newtonia soils; the Hoberg soils are also on terraces. None of these soils have a mollic epipedon together with as much as 50 percent base saturation in all horizons. Creldon, Hoberg, and Keeno soils have a fragipan. Eldon and Keeno soils have more coarse fragments in the surface layer and control section than Newtonia soils.

Typical pedon from an area of Newtonia silt loam, 1 to 3 percent slopes; about 630 feet north and 630 feet east of the junction of Battlefield and National Streets in Springfield; 2,225 feet south and 630 feet east of northwest corner of sec. 6, T. 28 N., R. 21 W., Greene County:

Ap—0 to 10 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate fine and very fine granular structure; very friable; many fine roots; common fine worm channels and casts; slightly acid; gradual smooth boundary.

B1—10 to 21 inches; dark brown (7.5YR 3/2) silty clay loam; moderate very fine and fine subangular blocky structure; friable; many fine roots; common fine worm channels and reddish brown worm casts; slightly acid; gradual smooth boundary.

B21t—21 to 27 inches; reddish brown (5YR 4/3 to 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; thin patchy clay films; common fine roots; common fine and medium worm channels and dark brown casts; few fine black concretions of manganese oxides; medium acid; gradual smooth boundary.

B22t—27 to 54 inches; red (2.5YR 4/6) silty clay loam; moderate fine and medium subangular blocky structure; firm; thin discontinuous clay films; common fine roots; common fine and medium black concretions of manganese oxides, and stains; medium acid; gradual smooth boundary.

B3—54 to 72 inches; red (2.5YR 4/8) silty clay; moderate fine angular and subangular blocky structure; firm; thin continuous clay films; common fine black concretions of manganese oxides, and stains; medium acid.

The thickness of the solum is more than 60 inches. Reaction ranges from neutral to medium acid.

The A1 or Ap horizon has hue of 10YR, 7.5YR, or 5YR; value of 2 or 3; and chroma of 2 or 3. The A horizon is slightly acid or medium acid if it has not been limed.

The B2t horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 3 through 8. The upper part of the B horizon is medium acid or strongly acid silty clay loam. The lower part is neutral to strongly acid silty clay loam, silty clay, or clay. Below a depth of 40 inches, chert content ranges from 0 to 15 percent, but cherty or very cherty pockets are common.

Nixa series

The Nixa series consists of deep, moderately well drained soils on uplands. Permeability is very slow. These soils have a fragipan at a depth of 14 to 24 inches. They formed in loamy residuum weathered from cherty limestone under deciduous forest vegetation. Slope ranges from 2 to 9 percent.

Nixa soils are similar to Clarksville and Wilderness soils. They are adjacent to or near Clarksville, Viraton, and Wilderness soils. Viraton soils are on upland and terrace positions. Clarksville soils do not have a fragipan. The surface layer and control section of Viraton soils contain less chert and more silt and clay than those parts of Nixa soils. Wilderness soils have a higher base saturation.

Typical pedon from an area of Nixa cherty silt loam, 2 to 9 percent slopes; 1,100 feet north and 2,045 feet west of southeast corner of sec. 21, T. 29 N., R. 26 W., Lawrence County:

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) cherty silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; many roots; 30 percent fine chert fragments; medium acid; clear smooth boundary.

A2—2 to 6 inches; grayish brown (10YR 5/2) cherty silt loam, light gray (10YR 7/2) dry; weak very fine and fine granular structure; very friable; common roots; common worm channels and casts; 30 percent fine chert fragments; very strongly acid; clear smooth boundary.

B1—6 to 18 inches; yellowish brown (10YR 5/4) very cherty silt loam; weak fine and medium subangular blocky structure; friable; few roots; few worm channels and casts; 65 percent fine chert fragments; very strongly acid; clear smooth boundary.

Bx1—18 to 28 inches; strong brown (7.5YR 5/6) very cherty silt loam; few fine faint light grayish brown and light brown mottles; massive; brittle; firm; thin patchy clay films on chert fragments; 65 percent fine chert fragments; very strongly acid; gradual wavy boundary.

Bx2—28 to 41 inches; mottled yellowish red (5YR 4/6), red (2.5YR 4/6), brown (10YR 5/3), and light brownish gray (10YR 6/2) very cherty silty clay loam; massive; brittle; very firm; thick patchy clay films on chert fragments; 75 percent chert fragments; very strongly acid; gradual wavy boundary.

IIB2t—41 to 72 inches; dark reddish brown (2.5YR 3/4) and dark red (2.5YR 3/6) cherty clay; moderate very fine and fine angular blocky structure; very firm; thick continuous clay films; about 30 percent chert fragments; strongly acid.

The depth to bedrock is more than 40 inches and commonly more than 72 inches. Chert content in the B horizon above the fragipan is 35 to 70 percent.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The Ap horizon has hue of 10YR, value of 4 through 6, and chroma of 3 through 6. It is cherty or very cherty analogs of silt loam or loam. The A1 horizon is very strongly acid or strongly acid if it has not been limed.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 through 6. It is very cherty analogs of silt loam, silty clay loam, clay loam, or loam.

An A'2 horizon is in some pedons. The Bx horizon has hue of 10YR or 7.5YR in the upper part. In many pedons, hue in the lower part of this horizon ranges to 5YR or 2.5YR. The Bx horizon is mottled with colors of lower chroma and colors of higher value. This horizon is very cherty silt loam, silty clay loam, clay loam, or loam. Below the fragipan are unconforming horizons of reddish clay or beds of chert and silty material.

Osage series

The Osage series consists of deep, poorly drained soils on flood plains. Permeability is very slow. These soils formed in clayey alluvium under deciduous forest and marsh or prairie vegetation. Slope ranges from 0 to 2 percent.

Osage soils are adjacent to or near Cedargap, Hepler, Huntington, and Lanton soils. Hepler soils are on terraces, and the other soils are on flood plains. Hepler and Huntington soils do not have a cumulic mollic epipedon. Hepler, Huntington, and Lanton soils have less clay and more silt than Osage soils, and Cedargap soils have more chert in the control section.

Typical pedon from an area of Osage silty clay loam; 1,320 feet south and 2,180 feet east of northwest corner of sec. 24, T. 29 N., R. 29 W., Lawrence County:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular and subangular blocky structure; friable; common roots; few fine pores and root channels; few fine concretions of iron and manganese oxides; medium acid; clear smooth boundary.

A12—8 to 13 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine and medium subangular and angular blocky structure; firm; common fine roots; few fine pores and root channels; common fine concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B21g—13 to 31 inches; very dark gray (10YR 3/1) silty clay; few fine distinct olive (5YR 5/3) mottles; weak fine and medium angular blocky structure; very firm; few fine roots; common fine concretions of iron and manganese oxides; medium acid; gradual smooth boundary.

B22g—31 to 52 inches; dark gray (5Y 4/1) and gray (5Y 5/1) silty clay; common medium faint olive (5Y 5/3) mottles; weak medium angular blocky structure; very firm; few slickensides; few fine pebbles; few concretions of calcium carbonate; common fine concretions of iron and manganese oxides; medium acid; gradual smooth boundary.

B3g—52 to 68 inches; mottled light gray (5Y 6/1), gray (5Y 5/1), and dark gray (2.5Y 4/1) silty clay; few medium faint pale olive (5Y 6/3) mottles; weak fine and medium angular blocky structure; very firm; few fine pebbles; common fine concretions of iron and manganese oxides; slightly acid.

The thickness of the solum ranges from about 40 to more than 60 inches. The mollic epipedon is 24 to more than 40 inches thick and includes part of the B horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is silty clay loam or silty clay and is medium acid or slightly acid.

The upper part of the B horizon has hue of 10YR through 5Y, value of 2 or 3, and chroma of less than 2. The lower part of the B horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of mostly 1 but ranges to 2. The B horizon is mostly silty clay, but the clay content ranges from 35 to about 50 percent. This horizon is strongly acid to neutral. Calcium carbonate concretions are in some pedons.

Parsons series

The Parsons series consists of deep, somewhat poorly drained soils on uplands. Permeability is very slow. These soils formed in a thin mantle of loess or loamy old alluvium and clayey residuum weathered from shale and cherty limestone under prairie vegetation. Slope ranges from 0 to 2 percent.

Parsons soils are adjacent to or near Carytown, Creldon, Gerald, and Sampsel soils. These soils are on positions similar to those of the Parsons soils. Carytown soils have an ochric epipedon and a natric horizon. Creldon and Gerald soils have a fragipan. Sampsel soils have a mollic epipedon but do not have an A2 horizon.

Typical pedon from an area of Parsons silt loam; 2,330 feet north and 480 feet west of southeast corner of sec. 1, T. 29 N., R. 29 W., Lawrence County:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; very friable; many roots; common worm channels and casts; few concretions of iron and manganese oxides; neutral; abrupt smooth boundary.

A2—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure; friable; common roots; common worm channels and casts; common concretions of iron and manganese oxides; strongly acid; abrupt smooth boundary.

B21t—14 to 19 inches; very dark grayish brown (10YR 3/2) clay; common medium distinct dark reddish brown (5YR 3/4) mottles; moderate very fine and fine angular blocky structure; very firm; thick continuous clay films; dark grayish brown (10YR 4/2) silty coatings on peds; common roots; few chert fragments; common concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

B22t—19 to 29 inches; very dark grayish brown (10YR 3/2) clay; many medium distinct dark reddish brown (10YR 3/4) mottles; weak medium and coarse prismatic and angular blocky structure; very firm; thick continuous clay films; few roots; few chert fragments; few concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

B3t—29 to 40 inches; coarsely mottled brown (10YR 4/3), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) clay; weak coarse angular blocky structure; very firm; continuous clay films; few chert fragments; few concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

C—40 to 66 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct strong brown (7.5YR 5/6) and fine faint dark gray mottles; massive; friable; thin patchy clay films; about 10 percent fine chert fragments in the lower part; few concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock is more than 60 inches.

The A1 or Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The Ap horizon of some deeply plowed pedons includes all of the A2 horizon. The combined thickness of the A horizon is 6 to 16 inches. It is silt loam and is neutral to strongly acid.

The B21t horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. Kneaded color has hue of 10YR through 7.5YR, value of 4, and chroma of 3 or 4. The B22t horizon is mottled and has hue of 10YR or 2.5Y; value of 3, 4, or 5; and chroma of 1 or 2. The Bt horizon is clay or silty clay, and some pedons are silty clay loam. It is slightly acid to strongly acid.

The B3 and C horizons have color and texture similar to those of the B2t horizon. A few to 15 percent chert fragments are common below a depth of 40 inches. The B3 and C horizons are strongly acid to mildly alkaline.

Pembroke series

The Pembroke series consists of deep, well drained soils on uplands and stream terraces. Permeability is moderate. These soils formed in residuum or in thin loess or alluvium and residuum weathered from stone under prairie vegetation. Slope ranges from 1 to 5 percent.

Pembroke soils are similar to Newtonia and Peridge soils. They are adjacent to or near the Creldon, Eldon, Gasconade, Hoberg, Keeno, and Newtonia soils. Creldon, Eldon, and Keeno soils are on upland positions similar to those of Pembroke soils, or on steeper positions, and Hoberg soils are on similar upland and terrace positions. Creldon, Hoberg, and Keeno soils have a fragipan. Eldon soils have more chert and clay in the control section than Pembroke soils. Newtonia soils have a mollic epipedon, and base saturation is 50 percent or more in all horizons. Gasconade soils are on upland slope breaks and are shallow to bedrock. Peridge soils have an ochric epipedon.

Typical pedon from an area of Pembroke silt loam, 1 to 5 percent slopes; 610 feet north and 530 feet east of southwest corner of sec. 8, T. 29 N., R. 22 W., Hilldale School, Greene County:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; very friable; many fine roots; many fine and medium worm channels and casts; about 1 percent fine chert fragments; medium acid; clear smooth boundary.

B1t—8 to 13 inches; reddish brown (5YR 4/4) silty clay loam; weak very fine and fine subangular blocky structure; friable; patchy clay films; common fine roots; common fine and medium worm channels and casts; about 2 percent fine chert fragments; strongly acid; clear smooth boundary.

B21t—13 to 26 inches; yellowish red (5YR 4/6) silty clay loam; common fine faint reddish brown mottles; moderate fine and very fine subangular blocky structure; friable; common clay films; common fine roots; common fine worm channels and casts; about 2 percent fine chert fragments; few fine black concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

B22t—26 to 39 inches; red (2.5YR 4/6) silty clay loam; moderate fine subangular blocky structure; firm; common clay films; few fine roots; few fine worm channels and casts; about 2 percent fine chert fragments; few fine black concretions of iron and manganese oxides; very strongly acid; gradual smooth boundary.

B23t—39 to 46 inches; red (2.5YR 4/6) silty clay loam; common medium prominent pale brown (10YR 6/3) and few fine prominent light brownish gray (10YR 6/2) mottles; weak fine and medium subangular and angular blocky structure; firm; common clay films; few fine roots; about 3 percent fine chert fragments; few fine black concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

B24t—46 to 72 inches; dark red (2.5YR 3/6) cherty clay; moderate very fine and fine angular blocky structure; very firm; thick continuous clay films; 35 percent coarse and fine chert fragments; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Reaction is very strongly acid to medium acid if the pedon has not been limed. The average coarse fragment content to a depth of 40 inches is less than 5 percent. Below a depth of 40 inches, coarse fragment content ranges from 1 to 35 percent.

The Ap horizon has hue of 10YR, 7.5YR, or 5YR; value of 3; and chroma of 2 or 3. The texture is silt loam or silty clay loam.

Some pedons do not have a B1t horizon. The B21t horizon ranges in color from yellowish red (5YR 4/6) through dark red (2.5YR 3/6). The B22t and B23t horizons range in color from yellowish red (5YR 4/6) through dark red (10YR 3/6). They are silty clay loam or silty clay. The B24t horizon ranges in color from dark red (2.5YR 3/6 or 10YR 3/6) through dusky red (10YR 3/4). It is mainly clay or silty clay but is cherty clay or cherty silty clay in pockets.

Peridge series

The Peridge series consists of deep, well drained soils on uplands and stream terraces. Permeability is moderate. These soils formed in thin loess or alluvium and residuum weathered from cherty limestone under deciduous forest vegetation. Slope ranges from 2 to 5 percent.

Peridge soils are similar to Newtonia and Pembroke soils. They are adjacent to or near Alsup, Freeburg, Goss, Secesh, Viraton, Waben, and Wilderness soils. The Newtonia, Pembroke, Alsup, Goss, Wilderness, and some Viraton soils are on upland positions similar to or steeper than those of Peridge soils. Freeburg, Secesh, Waben, and some Viraton soils are on terraces. Alsup soils have more clay and less silt than Peridge soils; Goss soils have more clay and chert and less silt; and Secesh, Viraton, Waben, and Wilderness soils have more chert and less silt. Freeburg soils have mottles low in chroma in the upper 10 inches of the argillic horizon. Viraton and Wilderness soils have a fragipan. Newtonia and Pembroke soils have a darker or thicker, dark colored surface layer.

Typical pedon from an area of Peridge silt loam, 2 to 5 percent slopes; 1,985 feet south and 1,225 feet west of northeast corner of sec. 5, T. 29 N., R. 23 W., Greene County:

Ap—0 to 9 inches; brown (7.5YR 4/4) silt loam, light brown (7.5YR 6/4) dry; moderate very fine and fine granular structure; very friable; many roots; many worm channels and casts; few chert fragments; slightly acid; clear smooth boundary.

B1t—9 to 15 inches; reddish brown (5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; friable; few fine chert fragments; few concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B21t—15 to 33 inches; yellowish red (5YR 4/6) silty clay loam; moderate and strong, fine and medium subangular blocky structure; firm; thin patchy clay films; common fine roots; few worm channels and casts; few fine chert fragments; few concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B22t—33 to 45 inches; red (2.5YR 4/6) silty clay loam; common medium coarse brown (7.5YR 5/4) and pale brown (10YR 6/3) mottles; moderate fine subangular and angular blocky structure; firm; patchy clay films; few fine chert fragments; few concretions of iron and manganese oxides; medium acid; clear wavy boundary.

B23t—45 to 56 inches; dark red (2.5YR 3/6) cherty clay; common fine and medium prominent light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; moderate fine angular blocky structure; very firm; thick continuous clay films; about 35 percent fine chert fragments; common concretions of iron

and manganese oxides; strongly acid; clear wavy boundary.

B24t—56 to 72 inches; dark red (2.5YR 3/6) cherty clay; moderate fine angular blocky structure; very firm; thick continuous clay films; about 35 percent chert fragments; common fine concretions of iron and manganese oxides; strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Reaction ranges from strongly acid to medium acid, unless the pedon has been limed. The average chert content ranges from 0 to 5 percent in the control section and from 0 to 35 percent in the B2t horizon below the control section.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. An Ap or A1 horizon 4 to 6 inches thick is present in some pedons. It has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3.

Some pedons do not have a B1t horizon. The B21t horizon has hue of 7.5YR or 2.5YR, value of 4, and chroma of 4 through 6. The B22t and B23t horizons have hue of 5YR through 10YR, value of 4 or 3, and chroma of 6. They are silty clay loam or cherty clay.

Sampsel series

The Sampsel series consists of deep, poorly drained soils on uplands. Permeability is slow. These soils mainly formed in loamy and clayey residuum weathered from calcareous shales and some limestone under prairie vegetation. Some areas formed in old alluvial-colluvial sediment. Slope ranges from 1 to 5 percent.

Sampsel soils are adjacent to or near Alsup, Carytown, Freeburg, Gasconade, Hepler, and Parsons soils. Alsup soils are at positions similar to those of Sampsel soils but at a higher elevation, and the nearly level Carytown soils are on uplands and terrace flats and in terrace depressions. Alsup and Carytown soils have an ochric epipedon. Carytown soils also have a natric horizon. Freeburg and Hepler soils are on terraces and have less clay and more silt in the upper part of the argillic horizon than Sampsel soils. Nearly level Parsons soils are on positions similar to those of Sampsel soils but at a higher elevation; also, Parsons soils have an A2 horizon. Gasconade soils are on upland slope breaks and are shallow to bedrock.

Typical pedon from an area of Sampsel silty clay loam, 2 to 5 percent slopes; 985 feet south and 1,445 feet east of northwest corner of sec. 15, T. 31 N., R 21 W., Greene County:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular and very fine subangular blocky structure; friable; many fine roots; common worm channels and casts; slightly acid; clear smooth boundary.

A12—8 to 13 inches; very dark gray (10YR 3/1) silty clay loam; moderate very fine subangular blocky structure; friable; common fine roots; few worm channels and casts; few fine concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

B1t—13 to 18 inches; very dark gray (10YR 3/1) silty clay; few fine faint dark grayish brown mottles; moderate very fine and fine angular blocky structure; firm; thin clay films; common fine roots; few worm channels and casts; many fine concretions of iron and manganese oxides; neutral; gradual smooth boundary.

B2t—18 to 36 inches; grayish brown (2.5Y 5/2) silty clay; common fine and medium distinct light olive brown (2.5Y 5/4), olive brown (2.5Y 4/4), and prominent strong brown (7.5YR 5/6) mottles; moderate and weak medium angular blocky structure; very firm; few roots; common fine concretions of iron and manganese oxides; neutral; clear smooth boundary.

B31—36 to 46 inches; mottled strong brown (7.5YR 5/6) and dark gray (5Y 4/1) silty clay; weak fine and medium angular blocky structure; firm; many fine concretions of iron and manganese oxides; about 10 percent fine chert and other coarse fragments; neutral; gradual wavy boundary.

B32—46 to 59 inches; mottled olive gray (5Y 5/2), pale olive (5Y 6/4), strong brown (7.5YR 5/6), and yellowish red (5YR 4/6) clay; weak medium and fine angular blocky structure; very firm; about 10 percent fine chert and other coarse fragments; mildly alkaline; gradual smooth boundary.

C—59 to 66 inches; mottled light olive gray (5Y 6/2), light gray (5Y 7/1 to 7/2), dark gray (5Y 4/1), and brownish yellow (10YR 6/6 to 6/8) clay; massive; very firm; about 10 percent chert and other coarse fragments; soft calcium accumulations; mildly alkaline.

The thickness of the solum and the depth to bedrock are more than 40 inches and commonly more than 60 inches. Some pedons have a few pebbles throughout. The A and Bt horizons range from medium acid to mildly alkaline. Below the Bt horizon, reaction is slightly acid to moderately alkaline.

The A1 or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam.

The B2t horizon mainly has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 1 or 2. It is dominantly silty clay but ranges to silty clay loam.

The B3 and C horizons have color and texture similar to those of the B2t horizon. Below a depth of 40 inches, chert or other coarse fragments range from a trace to about 15 percent.

Secesh series

The Secesh series consists of deep, well drained soils on stream terraces. Permeability is moderate. These soils formed in old, stratified, loamy and cherty loamy

alluvium under deciduous forest vegetation. Slope ranges from 0 to 2 percent.

Secesh soils are adjacent to or near Cedargap, Huntington, Lanton, Pembroke, Peridge, and Waben soils. Cedargap, Huntington, and Lanton soils are on flood plains and, except for Huntington soils, have a cumulic mollic epipedon. Pembroke, Peridge, and Waben soils are on positions similar to those of Secesh soils. Huntington, Pembroke, and Peridge soils have more silt and less chert or gravel in the control section than Secesh soils. Waben soils are cherty throughout.

Typical pedon of Secesh silt loam, from an area of Secesh-Cedargap silt loams; 2,210 feet north and 1,835 feet west of southeast corner of sec. 23, T. 26 N., R. 25 W., Lawrence County:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak very fine granular structure; very friable; few fine roots; common worm channels and casts; medium acid; clear smooth boundary.

B1—8 to 15 inches; brown (10YR 4/3) silt loam; moderate medium platy structure parting to weak fine and medium granular; friable; common fine roots; common worm channels and casts; few pebbles; medium acid; clear smooth boundary.

B21t—15 to 23 inches; brown (7.5YR 4/4) silt loam; weak medium and thick platy structure parting to fine subangular blocky; friable; few thin patchy clay films; few fine roots; common worm channels and casts; about 3 percent fine chert fragments; medium acid; clear smooth boundary.

B22t—23 to 38 inches; brown (7.5YR 4/4) cherty silty clay loam; few fine distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak and moderate fine subangular blocky structure; friable; thin patchy dark brown clay films partially coated with black oxide material; few worm channels and casts; about 30 percent fine chert fragments; medium acid; clear smooth boundary.

B23t—38 to 46 inches; reddish brown (5YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and thick platy structure parting to fine and medium subangular blocky; friable; thin patchy dark brown clay films sparsely coated with black oxide material; about 10 percent fine chert fragments; medium acid; clear smooth boundary.

B3t—46 to 60 inches; brown (7.5YR 4/4) very cherty silty clay loam; common medium distinct very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/4) mottles; weak and moderate fine and medium subangular blocky structure; firm; thick patchy dark brown clay films; about 65 percent chert fragments; medium acid.

The depth to nonconforming residuum, gravel beds, or consolidated bedrock is more than 40 inches and commonly more than 60 inches. The material above the Bt horizon is slightly acid to strongly acid, and the material below is commonly strongly acid to medium acid.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam.

The B2t horizon has hue of 7.5YR, 5YR, or 10YR; value of 4 or 5; and chroma of 4. Clay content ranges from 18 to 30 percent. Coarse fragment content ranges from 2 percent to about 35 percent. The B3t horizon is similar to the B2t horizon in color and texture. Chert content ranges from less than 5 percent to more than 50 percent in alternating bands.

Viraton series

The Viraton series consists of deep, moderately well drained soils on uplands and terraces. These soils have a fragipan at a depth of 16 to 36 inches. Permeability is moderate above the fragipan and slow in the fragipan. These soils formed in a thin mantle of loess or other loamy material and cherty limestone residuum or transported material under deciduous forest vegetation. Slope ranges from 2 to 5 percent.

Viraton soils are similar to Hoberg and Needleye soils. They are adjacent to or near Bado, Clarksville, Goss, Needleye, Nixa, Peridge, and Wilderness soils. These soils are on upland positions similar to those of Viraton soils. Peridge soils are also on terraces. Bado soils and some Needleye soils are nearly level to very gently sloping. Clarksville, Goss, Nixa, and Wilderness soils are steeper than Viraton soils. Bado soils have more clay and less silt; Needleye soils have more silt, less chert, and low chroma mottles in the upper 10 inches of the argillic horizon; and Nixa and Wilderness soils have more chert and less silt. Clarksville, Goss, and Peridge soils do not have a fragipan. Hoberg soils have a darker or thicker, dark colored A1 or Ap horizon.

Typical pedon from an area of Viraton silt loam, 2 to 5 percent slopes; 3,320 feet north and 1,520 feet east of southwest corner of sec. 29, T. 28 N., R. 22 W., Greene County:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; friable; many roots; trace of fine chert fragments; slightly acid; clear smooth boundary.

B1t—7 to 12 inches; yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) silty clay loam; weak very fine and fine subangular blocky structure; friable; thin patchy clay films; common roots; few dark grayish brown worm casts; trace of fine chert fragments; strongly acid; clear smooth boundary.

B21t—12 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; weak and moderate very fine and fine subangular blocky structure; friable; thin patchy clay

films; few roots; about 10 percent chert fragments; very strongly acid; clear smooth boundary.

B22t—18 to 22 inches; strong brown (7.5YR 5/6) silty clay loam; few fine distinct brown (10YR 5/3) and in the lower 2 inches light brownish gray (10YR 6/2) mottles; moderate and weak very fine and fine subangular blocky structure; firm; thin discontinuous clay films; about 12 percent chert fragments; very strongly acid; clear smooth boundary.

IIBx—22 to 34 inches; reddish brown (5YR 4/4 and 5/4) and yellowish red (5YR 4/6) very cherty silty clay loam; common fine prominent light brownish gray (10YR 6/2), medium dark gray (10YR 4/1), and fine distinct brown (10YR 5/3) mottles; massive; brittle; firm; thick patchy dark gray and reddish brown clay films; about 55 percent fine chert fragments; few fine concretions of iron and manganese oxides; extremely acid; clear wavy boundary.

IIB2t—34 to 72 inches; dark red (2.5YR 3/6) cherty clay; few fine and medium distinct light and dark, brown and gray mottles; moderate fine and medium angular blocky structure; very firm; thick continuous clay films; about 30 percent fine chert fragments; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The chert content, by volume, ranges from 0 to 15 percent in the A horizon and upper part of the B horizon. It ranges from 0 to 35 percent in the lower part of the B horizon above the fragipan, and from 15 to 80 percent in and below the fragipan. Reaction above the fragipan is medium acid to very strongly acid, unless the pedon has been limed. It is very strongly acid or extremely acid in the fragipan and very strongly acid to medium acid below the fragipan.

The A horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 2 through 4. Value is 3 if the A horizon is less than 6 inches thick. The A horizon is silt loam or loam. Some pedons have an A2 horizon.

The B2t horizon has hue of 10YR through 5YR, value of 4 or 5, and chroma of 4 through 6. It is silty clay loam or clay loam or cherty analogs of these textures.

The IIBx horizon is mottled with red, gray, and brown, and any of these colors may be dominant. Hue is 10YR through 2.5YR, value is 4 through 6, and chroma 2 through 6. The texture is cherty or very cherty silt loam or silty clay loam. Some pedons have a IIAx horizon.

In most pedons, the IIB2t horizon has hue of 2.5YR or 5YR, value of 3 through 5, and chroma of 4 through 6. The IIB2t horizon ranges from cherty or very cherty clay to cherty or very cherty silty clay loam.

Waben series

The Waben series consists of deep, well drained soils on terraces, alluvial-colluvial fans, and toe slopes. Permeability is moderately rapid. These soils formed in loamy cherty alluvium and colluvium under deciduous forest vegetation. Slope ranges from 0 to 5 percent.

Waben soils in Greene and Lawrence Counties have redder color and higher base saturation than is defined as the range for the series, but these differences do not significantly alter the usefulness and behavior of these soils.

Waben soils are adjacent to or near Cedargap, Clarksville, Nixa, Peridge, Secesh, and Wilderness soils. Cedargap soils are on flood plains and have a cumulic mollic epipedon. Clarksville, Nixa, and Wilderness soils are on locally higher uplands than Waben soils. Clarksville and Nixa soils have a lower base saturation. Nixa and Wilderness soils have a fragipan. Peridge and Secesh soils are on positions similar to those of Waben soils. Peridge soils do not have chert, and Secesh soils have less chert throughout.

Typical pedon of Waben cherty silt loam, from an area of Waben-Cedargap cherty silt loams, 0 to 5 percent slopes; 1,135 feet north and 555 feet east of southwest corner of sec. 28, T. 28 N., R. 25 W., Lawrence County:

Ap—0 to 7 inches; brown (7.5YR 4/2) cherty silt loam, brown (7.5YR 5/2) dry; strong fine granular structure; very friable; many roots; many worm channels and casts; 30 percent fine chert fragments and 5 percent coarse; strongly acid; clear smooth boundary.

B1—7 to 18 inches; brown (7.5YR 4/4) cherty silt loam; weak and moderate very fine subangular blocky and coarse granular structure; very friable; many roots; common worm channels and casts; about 35 percent fine chert fragments and 3 percent coarse; few concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

B21t—18 to 29 inches; yellowish red (5YR 5/6) very cherty silt loam; moderate very fine subangular blocky structure; friable; patchy clay films; common roots; common worm channels and casts; about 55 percent fine chert fragments and 3 percent coarse; few concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

B22t—29 to 39 inches; yellowish red (5YR 5/6) very cherty silty clay loam; moderate very fine subangular blocky structure; friable; patchy clay films; few roots; common worm channels and casts; 70 percent fine chert fragments and about 3 percent coarse; common concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

B31t—39 to 52 inches; reddish brown (2.5YR 4/4) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate and weak fine and medium subangular blocky structure; firm; thick patchy clay films; about 5 percent fine chert fragments and about 3 percent coarse; slightly acid; clear smooth boundary.

B32t—52 to 72 inches; reddish brown (2.5YR 4/4) very cherty loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate fine and very fine subangular blocky structure; firm; patchy clay

films; about 60 percent fine chert fragments and 3 percent coarse; common concretions of iron and manganese oxides; slightly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Reaction is strongly acid to slightly acid.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. Value is 3 if the horizon is less than 6 inches thick. Some pedons have an A2 horizon.

The B2t horizon has hue of 10YR through 5YR, value of 4 or 5, and chroma of 4 through 6.

Wilderness series

The Wilderness series consists of deep, moderately well drained soils on uplands. These soils have a fragipan at a depth of 15 to 29 inches. Permeability is moderate above the fragipan and slow in the fragipan. These soils formed in loamy and clayey residuum weathered from cherty limestone under deciduous forest vegetation. Slope ranges from 2 to 9 percent.

Wilderness soils are similar to Clarksville and Nixa soils. They are adjacent to or near Goss, Needleye, Peridge, Viraton, and Waben soils. Gently sloping to moderately steep Goss soils are on upland positions similar to those of Wilderness soils. Waben soils are on terraces, and Peridge and Viraton soils are on uplands and terraces. Clarksville, Goss, Peridge, and Waben soils do not have a fragipan. Peridge soils do not have chert, and Needleye soils have less chert than Wilderness soils. Nixa soils have lower base saturation.

Typical pedon from an area of Wilderness cherty silt loam, 2 to 9 percent slopes; 2,440 feet south and 1,250 feet east of northwest corner of sec. 1, T. 27 N., R. 27 W., Lawrence County:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) cherty silt loam, light brownish gray (10YR 6/2) dry; moderate very fine granular structure; very friable; many fine roots; common worm channels and casts; about 25 percent chert fragments; neutral; clear smooth boundary.

A1—2 to 10 inches; brown (10YR 4/3) cherty silt loam, very pale brown (10YR 7/3) dry; weak and moderate thin and medium platy structure breaking to fine granular; very friable; common fine roots; common worm channels and casts; about 25 percent chert fragments; medium acid; clear smooth boundary.

B1—10 to 14 inches; yellowish brown (10YR 5/4) cherty silt loam; weak and moderate very fine subangular blocky structure; friable; common fine roots; common worm channels and casts; about 40 percent chert fragments; very strongly acid; clear smooth boundary.

B2t—14 to 21 inches; brown (7.5YR 5/4) and strong brown (7.5YR 5/6) cherty silty clay loam; moderate fine subangular blocky structure; patchy clay films; firm; few fine roots; few worm channels and casts; about 35 percent chert fragments; very strongly acid; clear smooth boundary.

A2x—21 to 30 inches; pale brown (10YR 6/3) cherty silt loam; weak medium and thick platy structure; brittle; firm; about 40 percent chert fragments; very strongly acid; abrupt wavy boundary.

Bx—30 to 56 inches; mottled yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), yellowish red (5YR 5/6), and light gray (10YR 7/2) very cherty silty clay loam; weak medium and thick platy structure; firm; brittle; thick patchy clay films; about 75 percent chert fragments; few concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

IIB2t—56 to 72 inches; dark red (2.5YR 3/6) cherty clay; few fine distinct pinkish gray (5YR 6/2), light brown (7.5YR 6/4), and dark brown (7.5YR 4/4) mottles; moderate fine angular blocky structure; very firm; thick continuous clay films; about 40 percent chert fragments; very strongly acid.

The depth to bedrock and thickness of the solum are more than 60 inches.

The Ap or A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 2 or 3. If an A2 horizon is present, it has hue of 10YR, value of 4 through 6, and chroma of 2 through 4.

The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 through 6. It is cherty or very cherty silty clay loam and cherty or very cherty silt loam. The chert content of the B horizon ranges from 35 to 65 percent by volume. The B horizon ranges from medium acid through very strongly acid.

The fragipan is mottled with red, gray, and brown. Any of these colors may be dominant. The fragipan is cherty or very cherty silt loam or silty clay loam. The chert content ranges from 40 to 85 percent. The fragipan is very strongly acid or extremely acid.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Congeliturbate. Soil material disturbed by frost action.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat

excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors

responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation

application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate

types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na! to Ca!! + Mg!!. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil amendment. Any substance added to the soil for the purpose of promoting plant growth. Examples are agricultural lime, ground rock phosphate, and chemical fertilizers.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil

from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsidence. A downward movement of the ground surface caused by solution and collapse of the underlying soluble deposits, rearrangement of particles upon removal of coal, or reduction of fluid pressures within an aquifer or petroleum reservoir.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon and all of its subdivisions (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-75 at Springfield, Missouri]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	43.0	22.1	32.6	71	-5	0	1.64	.65	2.44	4	2.8
February---	47.0	26.1	36.6	74	0	6	2.21	1.14	3.08	5	4.0
March------	55.3	33.1	44.2	84	8	83	3.39	1.60	4.85	7	4.5
April------	67.7	44.3	56.0	87	23	215	3.96	2.34	5.40	7	.6
May--------	76.2	53.6	65.0	90	33	465	4.38	2.54	5.87	8	.0
June-------	84.6	62.4	73.5	96	44	705	4.53	2.03	6.56	7	.0
July-------	89.1	66.3	77.7	101	49	859	3.62	1.31	5.47	6	.0
August-----	88.6	64.8	76.7	100	50	828	2.76	1.12	4.08	5	.0
September--	80.5	57.5	69.1	96	38	573	4.38	1.49	6.69	7	.0
October----	70.3	46.3	58.3	89	26	280	3.27	1.34	4.83	5	.0
November---	55.7	34.2	45.0	78	12	40	2.92	1.20	4.30	5	2.4
December---	45.5	26.3	35.9	71	-2	11	2.68	1.21	3.86	6	2.8
Yearly:											
Average--	67.0	44.8	55.9	---	---	---	---	---	---	---	---
Extreme--	---	---	---	102	-6	---	---	---	---	---	---
Total----	---	---	---	---	---	4,065	39.74	32.02	47.08	72	17.1

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-75 at Springfield, Missouri]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 6	April 19	May 3
2 years in 10 later than--	April 1	April 15	April 28
5 years in 10 later than--	March 22	April 7	April 18
First freezing temperature in fall:			
1 year in 10 earlier than--	October 24	October 18	October 9
2 years in 10 earlier than--	October 29	October 23	October 14
5 years in 10 earlier than--	November 8	November 1	October 22

TABLE 3.--GROWING SEASON LENGTH

[Recorded in the period 1951-75 at Springfield, Missouri]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	204	189	168
8 years in 10	213	195	174
5 years in 10	230	207	187
2 years in 10	247	220	199
1 year in 10	256	226	206

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Greene county	Lawrence county	Total-- Area	Extent
		Acres	Acres	Acres	Pct
1B	Newtonia silt loam, 1 to 3 percent slopes	6,100	1,500	7,600	0.9
2B	Pembroke silt loam, 1 to 5 percent slopes	31,000	5,400	36,400	4.4
3D	Eldon cherty silt loam, 5 to 14 percent slopes	12,500	4,000	16,500	2.0
5C	Wilderness cherty silt loam, 2 to 9 percent slopes	51,500	64,000	115,500	13.9
6B	Creldon silt loam, 1 to 4 percent slopes	23,600	30,500	54,100	6.5
9B	Needleye silt loam, 1 to 3 percent slopes	21,500	223	21,723	2.6
10	Bado silt loam	2,050	193	2,243	0.3
11B	Sampsel silty clay loam, 2 to 5 percent slopes	2,200	570	2,770	0.3
16B	Barco fine sandy loam, 2 to 5 percent slopes	288	1,550	1,838	0.2
21B	Peridge silt loam, 2 to 5 percent slopes	25,750	6,200	31,950	3.9
23B	Bolivar fine sandy loam, 2 to 5 percent slopes	1,700	4,400	6,100	0.7
24	Parsons silt loam	0	8,600	8,600	1.0
26D	Collinsville fine sandy loam, 2 to 14 percent slopes	191	104	295	*
27D	Basehor stony fine sandy loam, 2 to 14 percent slopes	1,950	4,800	6,750	0.8
30C	Keeno cherty silt loam, 2 to 9 percent slopes	17,600	30,250	47,850	5.8
32C	Freeburg and Alsup silt loams, 2 to 9 percent slopes	5,100	0	5,100	0.6
33B	Keeno and Eldon cherty silt loams, 2 to 5 percent slopes	21,500	2,250	23,750	2.9
35D	Clarksville-Nixa cherty silt loams, 5 to 14 percent slopes	398	25,000	25,398	3.1
40E	Alsup very stony silt loam, 9 to 25 percent slopes	9,800	0	9,800	1.2
43D	Goss cherty silt loam, 5 to 14 percent slopes	65,500	16,100	81,600	9.9
44E	Goss-Gasconade complex, 2 to 50 percent slopes	16,200	3,000	19,200	2.3
45E	Clarksville cherty silt loam, 14 to 30 percent slopes	850	13,000	13,850	1.7
50C	Nixa cherty silt loam, 2 to 9 percent slopes	1,700	12,800	14,500	1.7
53B	Wilderness and Goss cherty silt loams, 2 to 5 percent slopes	18,700	2,450	21,150	2.6
54	Lanton silt loam	2,550	4,150	6,700	0.8
55	Huntington silt loam	12,200	15,300	27,500	3.3
56	Osage silty clay loam	294	650	944	0.1
61B	Hoberg silt loam, 2 to 5 percent slopes	0	39,500	39,500	4.8
76	Hepler silt loam	3,000	3,050	6,050	0.7
81B	Viraton silt loam, 2 to 5 percent slopes	29,500	53,000	82,500	9.9
83D	Gasconade-Rock outcrop complex, 2 to 20 percent slopes	17,700	367	18,067	2.2
94	Cedargap cherty silt loam	4,100	112	4,212	0.5
95	Cedargap silt loam	12,800	10,300	23,100	2.8
240	Gerald silt loam	1,400	5,100	6,500	0.8
241B	Parsons and Sampsel silt loams, 1 to 3 percent slopes	1,100	0	1,100	0.1
245	Carytown silt loam	0	2,400	2,400	0.3
921	Secesh-Cedargap silt loams	6,800	13,600	20,400	2.5
931	Waben-Cedargap cherty silt loams, 0 to 5 percent slopes	1,200	10,200	11,400	1.4
940	Dumps-Orthents complex	18	540	558	0.1
941	Pits and Dumps	630	191	821	0.1
943	Orthents, nearly level to strongly sloping	211	10	221	*
	Water	2,100	800	2,900	0.3
	Total	433,280	396,160	829,440	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Winter wheat	Soybeans	Grain sorghum	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Bu	Ton	AUM*
1B-----Newtonia	90	50	45	95	4.5	6.0
2B-----Pembroke	90	40	45	90	4.5	6.0
3D-----Eldon	---	20	---	---	2.5	4.0
5C-----Wilderness	---	17	---	35	2.0	4.0
6B-----Creldon	60	30	24	55	3.0	6.0
9B-----Needleye	55	30	26	55	2.8	5.6
10-----Bado	45	25	---	---	3.0	5.5
11B-----Sampsel	74	35	33	74	3.3	6.0
16B-----Barco	65	35	31	66	3.3	5.2
21B-----Peridge	80	40	40	90	4.5	6.0
23B-----Bolivar	60	32	28	61	3.0	5.0
24-----Parsons	65	35	30	65	3.0	6.0
26D-----Collinsville	---	---	---	---	---	3.0
27D-----Basehor	---	---	---	---	---	2.0
30C-----Keeno	35	25	19	45	2.3	4.0
32C-----Freeburg and Alsup	64	30	25	61	3.3	5.0
33B-----Keeno and Eldon	39	25	17	45	3.0	5.0
35D-----Clarksville-Nixa	---	---	---	---	1.5	3.0
40E-----Alsup	---	---	---	---	---	2.0
43D-----Goss	---	20	---	---	2.5	4.0
44E-----Goss-Gasconade	---	---	---	---	---	2.0

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Winter wheat	Soybeans	Grain sorghum	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Bu	Ton	AUM*
45E------ Clarksville	---	---	---	---	1.0	2.6
50C------ Nixa	---	15	---	30	1.8	3.0
53B------ Wilderness and Goss	35	30	25	45	3.0	5.0
54------ Lanton	95	45	40	90	4.5	6.0
55------ Huntington	100	50	43	100	5.0	6.0
56------ Osage	75	35	35	80	2.5	5.0
61B------ Hoberg	53	28	23	53	2.6	5.2
76------ Hepler	76	40	32	76	4.0	6.0
81B------ Viraton	48	26	21	48	2.5	5.0
83D------ Gasconade-Rock outcrop	---	---	---	---	---	1.0
94------ Cedargap	55	30	25	55	3.0	5.0
95------ Cedargap	65	35	30	65	3.3	5.5
240------ Gerald	65	34	28	65	3.2	5.0
241B------ Parsons and Sampsel	69	35	29	70	3.3	6.0
245------ Carytown	55	30	25	60	3.1	5.0
921------ Secesh-Cedargap	65	37	30	65	3.3	5.5
931------ Waben-Cedargap	---	25	20	38	3.0	5.0
940**. Dumps-Orthents						
941**. Pits and Dumps						
943**. Orthents						

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Dashes indicate no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I:				
Greene County	---	---	---	---
Lawrence County	---	---	---	---
II:				
Greene County	179,788	141,038	19,150	19,600
Lawrence County	198,543	138,443	27,600	32,500
III:				
Greene County	14,444	6,800	2,344	5,300
Lawrence County	17,955	4,400	3,243	10,312
IV:				
Greene County	123,500	---	---	123,500
Lawrence County	115,750	---	---	115,750
V:				
Greene County	---	---	---	---
Lawrence County	---	---	---	---
VI:				
Greene County	66,089	---	---	66,089
Lawrence County	41,204	---	---	41,204
VII:				
Greene County	46,500	---	---	46,500
Lawrence County	21,167	---	---	21,167
VIII:				
Greene County	---	---	---	---
Lawrence County	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
1B Newtonia	---	--------	--------	--------	--------	--------------------	---	White oak, black walnut, shortleaf pine, eastern white pine.
2B Pembroke	3o	Slight	Slight	Slight	Slight	Northern red oak	75	Eastern white pine, black walnut, green ash, shortleaf pine.
						White oak	66	
						Black oak	---	
3D Eldon	---	--------	--------	--------	--------		---	Black walnut, white oak, shortleaf pine.
5C Wilderness	4d	Slight	Slight	Moderate	Moderate	White oak	55	White oak, shortleaf pine, black oak.
						Black oak	---	
						Post oak	---	
6B Creldon	---	--------	--------	--------	--------		---	Pin oak, black oak, shortleaf pine, white oak, sweetgum, green ash.
9B Needleye	4d	Slight	Slight	Moderate	Moderate	White oak	60	White oak, shortleaf pine, black oak.
						Black oak	---	
10 Bado	5w	Slight	Severe	Moderate	Moderate	White oak	48	Black oak, sweetgum, pin oak, green ash.
						Black oak	52	
						Post oak	50	
11B Sampsel	---	--------	--------	--------	--------		---	Green ash, pin oak, eastern cottonwood, pecan.
16B Barco	---	--------	--------	--------	--------		---	White oak, black walnut, shortleaf pine, eastern white pine.
21B Peridge	3o	Slight	Slight	Slight	Slight	Northern red oak	70	Shortleaf pine, black walnut, white ash, yellow-poplar, white oak.
						Eastern redcedar	50	
						Black walnut	---	
						White oak	66	
						White ash	---	
						Black cherry	---	
						Black locust	---	
23B Bolivar	4o	Slight	Slight	Slight	Slight	White oak	57	White oak, green ash, shortleaf pine.
						Black oak	---	
						Northern red oak	---	
						Black walnut	---	
27D* Basehor	5d	Slight	Moderate	Moderate	Moderate	Black oak	45	Black oak, white oak, pin oak.
						White oak	45	
						Bitternut hickory	---	
						Black walnut	---	
30C Keeno	---	--------	--------	--------	--------		---	Black oak, white oak, shortleaf pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
32C*:								
Freeburg	3o	Slight	Slight	Slight	Slight	White oak	65	White oak, pin oak, green ash, eastern cottonwood, yellow-poplar, black oak, eastern redcedar, pecan.
Alsup	4o	Slight	Slight	Slight	Slight	Northern red oak White oak Black oak	60 --- ---	Northern red oak, white oak, black oak.
33B*:								
Keeno	---	--------	--------	--------	--------		---	Black oak, white oak, shortleaf pine.
Eldon	---	--------	--------	--------	--------		---	Black walnut, white oak, shortleaf pine.
35D*:								
Clarksville	4f	Slight	Moderate	Moderate	Slight	White oak Post oak Northern red oak Black oak	55 --- --- ---	White oak, shortleaf pine, sweetgum, green ash.
Nixa	4f	Slight	Moderate	Moderate	Moderate	Post oak Northern red oak White oak Eastern redcedar Black walnut	60 60 60 40 ---	Shortleaf pine, eastern redcedar, northern red oak, black oak.
40E Alsup	4x	Moderate	Severe	Moderate	Slight	Northern red oak White oak Black oak	60 --- ---	Northern red oak, white oak, black oak, shortleaf pine.
43D Goss	4f	Slight	Moderate	Slight	Slight	White oak Post oak Blackjack oak Black oak	60 --- --- ---	Sweetgum, yellow-poplar, green ash, shortleaf pine.
44E*:								
Goss	4f	Moderate	Severe	Severe	Slight	White oak Post oak Blackjack oak Black oak	60 --- --- ---	Sweetgum, yellow-poplar, green ash, shortleaf pine.
Gasconade	5d	Moderate	Severe	Moderate	Moderate	Eastern redcedar Chinkapin oak Sugar maple	30 --- ---	Eastern redcedar, shortleaf pine.
45E Clarksville	4f	Slight	Moderate	Moderate	Slight	White oak Black oak Post oak Northern red oak	55 --- --- ---	White oak, shortleaf pine, sweetgum, green ash.
50C Nixa	4f	Slight	Slight	Moderate	Moderate	Northern red oak White oak Eastern redcedar Black walnut	60 60 40 ---	Shortleaf pine, eastern redcedar, northern red oak, black oak.
53B*:								
Wilderness	4d	Slight	Slight	Moderate	Moderate	White oak Black oak	55 ---	White oak, shortleaf pine, black oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
53B*:								
Goss	4f	Slight	Moderate	Slight	Slight	White oak	60	Sweetgum, green ash.
						Post oak	---	
						Blackjack oak	---	
						Black oak	---	
54 Lanton	2w	Slight	Severe	Severe	Slight	Eastern cottonwood	100	Eastern cottonwood, pecan, pin oak.
						Pin oak	90	
						Pecan	90	
55 Huntington	1o	Slight	Slight	Slight	Slight	Northern red oak	85	Yellow-poplar, black walnut.
						Black walnut	80	
						American sycamore	80	
						White oak	---	
56 Osage	4w	Slight	Moderate	Moderate	Moderate	Pin oak	66	Pin oak, pecan.
						Pecan	55	
						Eastern cottonwood	---	
61B Hoberg	4d	Slight	Slight	Moderate	Moderate	White oak	60	White oak, shortleaf pine, black oak.
						Black oak	---	
						Post oak	---	
76 Hepler	3o	Slight	Slight	Slight	Slight	Eastern cottonwood	90	Pecan, green ash, American sycamore.
						Northern red oak	65	
						Common hackberry	76	
						Shagbark hickory	56	
						Green ash	73	
						White oak	67	
81B Viraton	4d	Slight	Slight	Moderate	Moderate	White oak	55	White oak, black oak, shortleaf pine.
						Black oak	60	
						Post oak	---	
83D*:								
Gasconade	5d	Slight	Moderate	Moderate	Moderate	Eastern redcedar	30	Eastern redcedar, shortleaf pine.
						Chinkapin oak	---	
						Redbud	---	
						Sugar maple	---	
Rock outcrop.								
94, 95 Cedargap	3f	Slight	Slight	Moderate	Slight	Black oak	66	Black oak, shortleaf pine.
240 Gerald	---	---------	---------	---------	---------		---	Shortleaf pine, black oak, green ash, eastern white pine, pin oak.
241B*:								
Parsons	---	-------	---------	---------	-------	-------------------	---	Pin oak, sweetgum.
Sampsel	---	---------	---------	---------	---------		---	Green ash, pin oak, American sycamore, eastern cottonwood, pecan, sweetgum.
245 Carytown	5w	Slight	Severe	Moderate	Moderate	Pin oak	50	Pin oak, American sycamore, sweetgum.
921*:								
Secesh	4o	Slight	Slight	Slight	Slight	White oak	60	Black walnut, shortleaf pine, American sycamore.
						American sycamore	---	
						Black walnut	---	
						Black oak	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Cedargap----------	3f	Slight	Slight	Moderate	Slight	Black oak-----------	66	Black oak, shortleaf pine.
931*:								
Waben-------------	3f	Slight	Slight	Moderate	Slight	Northern red oak---- Eastern redcedar---- Black walnut-------- Black cherry-------- White oak-----------	70 40 --- --- ---	Shortleaf pine, eastern redcedar, black walnut.
Cedargap----------	3f	Slight	Slight	Moderate	Slight	Black oak-----------	66	Black oak, shortleaf pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
1B: Newtonia	---	Lilac, Amur honeysuckle, autumn-olive, Amur maple.	Eastern redcedar, common hackberry, Russian-olive.	Norway spruce, eastern white pine, honeylocust, green ash, pin oak.	---
2B: Pembroke	---	Lilac, Amur honeysuckle, autumn-olive, Amur maple.	Eastern redcedar, common hackberry, Russian-olive.	Norway spruce, eastern white pine, honeylocust, green ash, pin oak.	---
3D: Eldon	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Green ash, common hackberry, honeylocust, bur oak, Russian-olive, Austrian pine, eastern redcedar.	Siberian elm	---
5C: Wilderness	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Honeylocust, Austrian pine, common hackberry, eastern redcedar, green ash, bur oak, Russian-olive.	Siberian elm	---
6B: Creldon	Lilac	Autumn-olive, Manchurian crabapple, Amur honeysuckle, Amur maple.	Common hackberry, eastern redcedar, Austrian pine, green ash, jack pine, Russian-olive.	Honeylocust	---
9B: Needleye	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Eastern redcedar, Austrian pine, common hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
10: Bado	Lilac	Manchurian crabapple, autumn-olive, Amur honeysuckle, Amur maple.	Common hackberry, Austrian pine, green ash, Russian-olive, jack pine, eastern redcedar.	Honeylocust	---
11B: Sampsel	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, common hackberry.	Norway spruce, honeylocust, green ash, silver maple, golden willow, northern red oak.	Eastern cottonwood.
16B: Barco	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Green ash, eastern redcedar, bur oak, Russian-olive, Austrian pine, common hackberry.	Siberian elm, honeylocust.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
21B: Peridge	---	Lilac, Amur honeysuckle, autumn-olive, Amur maple.	Common hackberry, Russian-olive.	Norway spruce, eastern white pine, honeylocust, green ash, pin oak.	---
23B: Bolivar	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Green ash, common hackberry, bur oak, Russian-olive, Austrian pine, eastern redcedar.	Siberian elm, honeylocust.	---
24: Parsons	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Austrian pine, common hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
26D*: Collinsville	---	---	Eastern redcedar	---	---
27D*. Basehor					
30C: Keeno	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
32C*:					
Freeburg	---	Amur maple, Amur honeysuckle, autumn-olive, lilac.	Eastern redcedar	Common hackberry, pin oak, eastern white pine, green ash, honeylocust, Austrian pine.	Eastern cottonwood.
Alsup	---	Amur maple, lilac, autumn-olive, Amur honeysuckle.	Eastern redcedar, Russian-olive, common hackberry.	Eastern white pine, honeylocust, pin oak, green ash, Norway spruce.	---
33B*:					
Keeno	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
Eldon	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Green ash, common hackberry, honeylocust, bur oak, Russian-olive, Austrian pine, eastern redcedar.	Siberian elm	---
35D*: Clarksville.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
35D*:					
Nixa	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
40E. Alsup					
43D Goss	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
44E*:					
Goss	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
Gasconade.					
45E. Clarksville					
50C Nixa	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
53B*:					
Wilderness	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Honeylocust, Austrian pine, common hackberry, eastern redcedar, green ash, bur oak, Russian-olive.	Siberian elm	---
Goss	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
54 Lanton	---	Amur honeysuckle, lilac, autumn-olive, Amur maple.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, common hackberry, green ash, pin oak.	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
55 Huntington	---	Amur honeysuckle, lilac, autumn-olive, Amur maple.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, common hackberry, green ash, pin oak.	Eastern cottonwood.
56 Osage	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, common hackberry.	Norway spruce, honeylocust, green ash, silver maple, golden willow, northern red oak.	Eastern cottonwood.
61B Hoberg	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Eastern redcedar, Austrian pine, common hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
76 Hepler	---	Autumn-olive, Amur honeysuckle, lilac, Amur maple.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, common hackberry, green ash, pin oak.	Eastern cottonwood.
81B Viraton	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Eastern redcedar, Austrian pine, common hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
83D*: Gasconade.					
Rock outcrop.					
94, 95 Cedargap	---	Amur maple, Amur honeysuckle, autumn-olive, lilac.	Eastern redcedar	Common hackberry, Austrian pine, eastern white pine, green ash, honeylocust, pin oak.	Eastern cottonwood.
240 Gerald	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Eastern redcedar, Austrian pine, common hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
241B*: Parsons	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Austrian pine, common hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
Sampsel	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, common hackberry.	Norway spruce, honeylocust, green ash, silver maple, golden willow, northern red oak.	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
245----------------Carytown	Tatarian honeysuckle, lilac, silver buffaloberry.	Eastern redcedar, Siberian peashrub.	Green ash, Russian-olive.	Siberian elm, golden willow, white willow.	Eastern cottonwood.
921*:					
Secesh-----------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Cedargap---------	---	Amur maple, Amur honeysuckle, autumn-olive, lilac.	Eastern redcedar	Common hackberry, Austrian pine, eastern white pine, green ash, honeylocust, pin oak.	Eastern cottonwood.
931*:					
Waben------------	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive------	Eastern redcedar, Austrian pine, honeylocust, common hackberry, green ash, bur oak, Russian-olive.	Siberian elm------	---
Cedargap---------	---	Amur maple, Amur honeysuckle, autumn-olive, lilac.	Eastern redcedar	Common hackberry, Austrian pine, eastern white pine, green ash, honeylocust, pin oak.	Eastern cottonwood.
940*:					
Dumps.					
Orthents.					
941*:					
Pits.					
Dumps.					
943*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1B: Newtonia	Slight	Slight	Moderate: slope.	Slight	Slight.
2B: Pembroke	Slight	Slight	Moderate: slope.	Slight	Slight.
3D: Eldon	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
5C: Wilderness	Severe: wetness.	Moderate: wetness, small stones.	Severe: small stones, wetness.	Moderate: wetness.	Severe: droughty.
6B: Creldon	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
9B: Needleye	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty.
10: Bado	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
11B: Sampsel	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
16B: Barco	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
21B: Peridge	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
23B: Bolivar	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
24: Parsons	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
26D*: Collinsville	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Slight	Severe: thin layer.
27D*: Basehor	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: large stones.	Severe: large stones, thin layer.
30C: Keeno	Severe: small stones.	Severe: small stones.	Severe: small stones.	Moderate: large stones.	Severe: small stones, large stones, droughty.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
32C*:					
Freeburg	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness.	Severe: erodes easily.	Moderate: wetness.
Alsup	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.	Moderate: too clayey.
33B*:					
Keeno	Severe: small stones.	Severe: small stones.	Severe: small stones.	Moderate: large stones.	Severe: small stones, large stones, droughty.
Eldon	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
35D*:					
Clarksville	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily, small stones.	Severe: small stones.
40E Alsup	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Moderate: large stones, too clayey.
43D Goss	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Severe: droughty.
44E*:					
Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, small stones.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
45E Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
50C Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily, small stones.	Severe: small stones.
53B*:					
Wilderness	Severe: wetness.	Moderate: wetness, small stones.	Severe: small stones, wetness.	Moderate: wetness.	Severe: droughty.
Goss	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Severe: droughty.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
54-------------------- Lanton	Severe: floods, wetness.	Moderate: floods, wetness, percs slowly.	Severe: wetness, floods.	Severe: erodes easily.	Severe: floods.
55-------------------- Huntington	Severe: floods.	Slight----------	Moderate: floods.	Slight------------	Moderate: floods.
56-------------------- Osage	Severe: floods, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.
61B------------------- Hoberg	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
76-------------------- Hepler	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods.	Severe: erodes easily.	Moderate: floods.
81B------------------- Viraton	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: wetness.
83D*:					
Gasconade------------	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, small stones.	Severe: large stones.	Severe: large stones, thin layer.
Rock outcrop.					
94-------------------- Cedargap	Severe: floods, small stones.	Severe: small stones.	Severe: small stones, floods.	Severe: small stones.	Severe: small stones, floods.
95-------------------- Cedargap	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
240------------------- Gerald	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty.
241B*:					
Parsons--------------	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
Sampsel--------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
245------------------- Carytown	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, erodes easily.	Severe: excess sodium, wetness.
921*:					
Secesh---------------	Severe: floods.	Slight----------	Moderate: floods.	Slight------------	Moderate: floods.
Cedargap-------------	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
931*:					
Waben----------------	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
Cedargap-------------	Severe: floods, small stones.	Severe: small stones.	Severe: small stones, floods.	Severe: small stones.	Severe: small stones, floods.
940*. Dumps-Orthents					
941*. Pits and Dumps					
943*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1B: Newtonia	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
2B: Pembroke	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
3D: Eldon	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
5C: Wilderness	Poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
6B: Creldon	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
9B: Needleye	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
10: Bado	Fair	Fair	Good	Fair	Poor	Good	Good	Poor	Fair	Good.
11B: Sampsel	Fair	Good	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
16B: Barco	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
21B: Peridge	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
23B: Bolivar	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
24: Parsons	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
26D*: Collinsville	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
27D*: Basehor	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
30C: Keeno	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor.
32C*:										
Freeburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Alsup	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
33B*:										
Keeno	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor.
Eldon	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
35D*:										
Clarksville	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITATS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
35D*:										
Nixa	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
40E Alsup	Poor	Fair	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
43D Goss	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
44E*:										
Goss	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Gasconade	Very poor	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
45E Clarksville	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
50C Nixa	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
53B*:										
Wilderness	Poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
Goss	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
54 Lanton	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
55 Huntington	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
56 Osage	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
61B Hoberg	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
76 Hepler	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
81B Viraton	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
83D*:										
Gasconade	Very poor	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Rock outcrop.										
94, 95 Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
240 Gerald	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
241B*:										
Parsons	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sampsel	Fair	Good	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
245. Carytown	Poor	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
921*:										
Secesh	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
931*:										
Waben	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Fair.
Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
940*. Dumps-Orthents										
941*. Pits and Dumps										
943*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1B Newtonia	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
2B Pembroke	Moderate: too clayey.	Slight	Moderate: shrink-swell.	Slight	Severe: low strength.	Slight.
3D Eldon	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: small stones, large stones, slope.
5C Wilderness	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: droughty.
6B Creldon	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
9B Needleye	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness, droughty.
10 Bado	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
11B Sampsel	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
16B Barco	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: thin layer.
21B Peridge	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
23B Bolivar	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: thin layer.
24 Parsons	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
26D* Collinsville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
27D* Basehor	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: large stones, thin layer.
30C Keeno	Moderate: too clayey, dense layer, large stones.	Moderate: large stones.	Moderate: wetness, large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Severe: small stones, large stones, droughty.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
32C*:						
Freeburg	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, frost action, floods.	Severe: floods.
Alsup	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: large stones.
33B*:						
Keeno	Moderate: too clayey, dense layer, large stones.	Moderate: large stones.	Moderate: wetness, large stones.	Moderate: large stones.	Moderate: frost action, large stones.	Severe: small stones, large stones, droughty.
Eldon	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Moderate: small stones, large stones.
35D*:						
Clarksville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
Nixa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.
40E Alsup	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, large stones.
43D Goss	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: low strength, slope, frost action.	Severe: droughty.
44E*:						
Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Gasconade	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
45E Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
50C Nixa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.
53B*:						
Wilderness	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: droughty.
Goss	Moderate: too clayey, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: low strength, frost action.	Severe: droughty.
54 Lanton	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods.	Severe: floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
55---------------- Huntington	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
56---------------- Osage	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness.
61B--------------- Hoberg	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
76---------------- Hepler	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: floods.
81B--------------- Viraton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, low strength.	Moderate: wetness.
83D*:						
Gasconade--------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
Rock outcrop.						
94---------------- Cedargap	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: small stones, floods.
95---------------- Cedargap	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
240--------------- Gerald	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
241B*:						
Parsons----------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Sampsel----------	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
245--------------- Carytown	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: excess sodium, wetness.
921*:						
Secesh-----------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Cedargap---------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
931*:						
Waben------------	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Severe: small stones.
Cedargap---------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: small stones, floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
940*. Dumps-Orthents						
941*. Pits and Dumps						
943*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1B------------------ Newtonia	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Fair: too clayey.
2B------------------ Pembroke	Slight-----------	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
3D------------------ Eldon	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
5C------------------ Wilderness	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, small stones.
6B------------------ Creldon	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack, small stones.
9B------------------ Needleye	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: small stones, too clayey, hard to pack.
10------------------ Bado	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness.	Severe: wetness.	Poor: wetness, thin layer.
11B----------------- Sampsel	Severe: wetness, percs slowly.	Moderate: slope.	Severe: depth to rock, wetness, too clayey.	Moderate: depth to rock, wetness.	Poor: too clayey, hard to pack.
16B----------------- Barco	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim.
21B----------------- Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
23B----------------- Bolivar	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
24------------------ Parsons	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
26D*---------------- Collinsville	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: area reclaim.
27D*---------------- Basehor	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, large stones.	Severe: depth to rock, seepage.	Poor: area reclaim, large stones.
30C----------------- Keeno	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: large stones.	Severe: seepage.	Poor: small stones.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
32C*:					
Freeburg	Severe: wetness, floods, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.	Fair: too clayey, wetness.
Alsup	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness.	Poor: too clayey, hard to pack.
33B*:					
Keeno	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: large stones.	Severe: seepage.	Poor: small stones.
Eldon	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
35D*:					
Clarksville	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Severe: seepage.	Poor: too clayey, small stones.
Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
40E Alsup	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, small stones.
43D Goss	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Severe: too clayey, large stones.	Severe: seepage.	Poor: too clayey, small stones.
44E*:					
Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
Gasconade	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
45E Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
50C Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
53B*:					
Wilderness	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, small stones.
Goss	Moderate: percs slowly, large stones.	Severe: seepage.	Severe: too clayey, large stones.	Severe: seepage.	Poor: too clayey, small stones.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
54----------------- Lanton	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness, thin layer.
55----------------- Huntington	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
56----------------- Osage	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
61B---------------- Hoberg	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
76----------------- Hepler	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: too clayey, wetness.
81B---------------- Viraton	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
83D*:					
Gasconade----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.					
94, 95------------- Cedargap	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
240---------------- Gerald	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
241B*:					
Parsons------------	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Sampsel------------	Severe: wetness, percs slowly.	Slight-----------	Severe: depth to rock, wetness, too clayey.	Moderate: depth to rock, wetness.	Poor: too clayey, hard to pack.
245---------------- Carytown	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey, excess sodium.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
921*:					
Secesh-------------	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
Cedargap-----------	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
931*:					
Waben	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
Cedargap	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
940*. Dumps-Orthents					
941*. Pits and Dumps					
943*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1B-------------------- Newtonia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
2B-------------------- Pembroke	Poor: low strength, frost action.	Improbable: excess fines.	Improbable: excess fines.	Good.
3D-------------------- Eldon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
5C-------------------- Wilderness	Fair: large stones, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
6B-------------------- Creldon	Fair: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
9B-------------------- Needleye	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
10-------------------- Bado	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
11B------------------- Sampsel	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
16B------------------- Barco	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
21B------------------- Peridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
23B------------------- Bolivar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
24-------------------- Parsons	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
26D*------------------ Collinsville	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
27D*------------------ Basehor	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
30C------------------- Keeno	Fair: large stones, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
32C*:				
Freeburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Alsup	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
33B*:				
Keeno	Fair: large stones, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Eldon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
35D*:				
Clarksville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Nixa	Poor: area reclaim.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
40E Alsup	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
43D Goss	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
44E*:				
Goss	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Gasconade	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
45E Clarksville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
50C Nixa	Poor: area reclaim.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
53B*:				
Wilderness	Fair: large stones, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Goss	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
54 Lanton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
55 Huntington	Poor: frost action.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
56 Osage	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
61B Hoberg	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
76 Hepler	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
81B Viraton	Fair: wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
83D*:				
Gasconade	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Rock outcrop.				
94, 95 Cedargap	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
240 Gerald	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
241B*:				
Parsons	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Sampsel	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
245 Carytown	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
921*:				
Secesh	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Cedargap	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
931*:				
Waben	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Cedargap	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
940*. Dumps-Orthents				

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
941*. Pits and Dumps				
943*. Orthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1B: Newtonia	Moderate: seepage.	Moderate: compressible, unstable fill.	Not needed	Favorable	Favorable	Favorable.
2B: Pembroke	Moderate: seepage.	Moderate: hard to pack.	Not needed	Slope, slow intake.	Slope	Slope.
3D: Eldon	Severe: slope.	Moderate: hard to pack, large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
5C: Wilderness	Moderate: slope.	Moderate: large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, wetness.
6B: Creldon	Moderate: seepage.	Moderate: hard to pack, wetness.	Percs slowly, large stones.	Wetness, percs slowly, rooting depth	Large stones, erodes easily	Erodes easily, rooting depth.
9B: Needleye	Moderate: slope.	Severe: hard to pack.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Wetness, large stones, percs slowly.	Erodes easily, droughty, rooting depth.
10: Bado	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth	Erodes easily, wetness, rooting depth	Wetness, erodes easily rooting depth.
11B: Sampsel	Moderate: depth to rock, slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
16B: Barco	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock slope.	Depth to rock, soil blowing.	Depth to rock.
21B: Peridge	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
23B: Bolivar	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock slope.	Depth to rock, soil blowing.	Depth to rock.
24: Parsons	Slight	Severe: wetness.	Percs slowly	Wetness, percs slowly, erodes easily	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
26D*: Collinsville	Severe: depth to rock, slope.	Slight	Deep to water	Depth to rock. slope.	Slope, depth to rock	Slope, depth to rock.
27D*: Basehor	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, depth to rock
30C: Keeno	Severe: seepage.	Severe: large stones.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, droughty.
32C*:						
Freeburg	Moderate: slope.	Moderate: wetness.	Frost action, slope.	Wetness, slope, erodes easily	Erodes easily, wetness.	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
32C*:						
Alsup	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack, large stones.	Slope	Wetness, slope, erodes easily	Large stones, erodes easily	Large stones, erodes easily
33B*:						
Keeno	Severe: seepage.	Severe: large stones.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, droughty.
Eldon	Moderate: seepage, slope.	Moderate: hard to pack, large stones.	Deep to water	Droughty, slope.	Large stones	Large stones, droughty.
35D*:						
Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Nixa	Severe: slope.	Moderate: thin layer, seepage, piping.	Deep to water	Droughty, percs slowly, depth to rock	Slope, large stones, depth to rock	Slope, erodes easily droughty.
40E Alsup	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Slope	Wetness, droughty, slope.	Slope, large stones, wetness.	Large stones, slope, droughty.
43D Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
44E*:						
Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Gasconade	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty.	Slope, large stones, depth to rock	Large stones, slope, droughty.
45E Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
50C Nixa	Severe: slope.	Moderate: thin layer, seepage, piping.	Deep to water	Droughty, percs slowly, depth to rock	Slope, large stones, depth to rock	Slope, erodes easily, droughty.
53B*:						
Wilderness	Moderate: slope.	Moderate: large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, wetness.
Goss	Moderate: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Large stones	Large stones, droughty.
54 Lanton	Slight	Severe: piping, wetness.	Percs slowly, floods.	Wetness, percs slowly, erodes easily	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
55 Huntington	Moderate: seepage.	Severe: piping.	Not needed	Floods, slope.	Not needed	Not needed.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
56 Osage	Slight	Severe: hard to pack, wetness.	Percs slowly, floods.	Wetness	Wetness, percs slowly.	Wetness, percs slowly.
61B Hoberg	Moderate: seepage, slope.	Moderate: thin layer, large stones, wetness.	Percs slowly, large stones, slope.	Wetness, droughty, percs slowly.	Large stones, erodes easily wetness.	Large stones, erodes easily, droughty.
76 Hepler	Moderate: seepage.	Moderate: piping, wetness.	Floods	Wetness, erodes easily floods.	Erodes easily, wetness.	Erodes easily.
81B Viraton	Moderate: slope.	Moderate: wetness, piping.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Erodes easily, wetness.	Erodes easily, droughty.
83D*:						
Gasconade	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty.	Large stones, depth to rock	Large stones, droughty.
Rock outcrop.						
94 Cedargap	Severe: seepage.	Moderate: large stones.	Deep to water	Droughty, floods.	Large stones	Large stones.
95 Cedargap	Severe: seepage.	Slight	Deep to water	Floods	Large stones	Favorable.
240 Gerald	Slight	Moderate: piping, wetness.	Percs slowly, frost action.	Wetness, droughty, percs slowly.	Erodes easily, wetness, rooting depth	Wetness, erodes easily, droughty.
241B*:						
Parsons	Slight	Severe: wetness.	Percs slowly	Wetness, percs slowly, erodes easily	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Sampsel	Moderate: depth to rock, slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
245 Carytown	Slight	Severe: hard to pack, wetness, excess sodium.	Percs slowly, excess sodium	Wetness, percs slowly, erodes easily	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.
921*:						
Secesh	Severe: seepage.	Slight	Deep to water	Floods	Large stones	Favorable.
Cedargap	Severe: seepage.	Slight	Deep to water	Floods	Large stones	Favorable.
931*:						
Waben	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Favorable	Droughty.
Cedargap	Severe: seepage.	Moderate: large stones.	Deep to water	Droughty, floods.	Large stones	Large stones.
940*. Dumps-Orthents						
941*. Pits and Dumps						
943*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1B---------------- Newtonia	0-10	Silt loam--------	CL, ML	A-4, A-6	0	100	100	96-100	65-97	30-37	9-14
	10-21	Silt loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	96-100	80-98	30-40	9-16
	21-27	Silty clay loam	CL	A-6, A-7	0	100	100	98-100	90-98	33-42	12-19
	27-54	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	100	96-100	90-98	37-60	15-34
	54-72	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	75-100	75-100	70-98	70-98	37-60	15-34
2B---------------- Pembroke	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	70-100	25-35	3-11
	8-46	Silty clay loam	GC, CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	75-100	30-43	10-25
	46-72	Silty clay, clay, cherty clay.	CH, CL, GC	A-7	0-5	85-100	75-100	70-100	45-95	45-70	25-50
3D---------------- Eldon	0-10	Cherty silt loam	ML, CL-ML, CL	A-4	5-25	70-95	65-90	60-85	55-80	20-30	2-8
	10-31	Very cherty silty clay loam, very cherty silty clay.	GC, GP-GC	A-2-7, A-7	5-15	20-50	15-45	15-40	10-40	40-50	25-30
	31-72	Silty clay, clay, cherty silty clay.	CL, CH	A-7	0-15	80-100	65-100	65-95	65-95	45-65	25-35
5C---------------- Wilderness	0-10	Cherty silt loam	SM-SC, SC, SP-SC, GC	A-1, A-4, A-2-4	0-10	60-85	50-75	20-50	10-40	20-30	5-10
	10-21	Very cherty silty clay loam, cherty silty clay loam, cherty silt loam	GC, GP-GC, SC, SP-SC	A-6, A-2-6	5-15	40-70	20-60	10-50	10-40	25-40	10-20
	21-56	Very cherty silt loam, very cherty silty clay loam, cherty silt loam	GM-GC, GC, GP-GC	A-1, A-2-4, A-2-6	10-40	30-60	10-45	10-40	5-35	20-40	5-15
	56-72	Very cherty silty clay, cherty clay.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25
6B---------------- Creldon	0-9	Silt loam--------	ML, CL-ML, CL	A-4	0-5	95-100	95-100	90-100	80-95	15-30	2-10
	9-24	Silty clay loam, silty clay.	CL	A-6, A-7	0-5	80-100	70-100	65-95	60-95	35-45	11-20
	24-36	Cherty silty clay loam, cherty silt loam, silty clay loam.	CL, GC, SC	A-2, A-6, A-7	0-25	40-80	30-70	25-65	20-60	30-45	11-20
	36-67	Cherty silty clay, cherty clay, cherty clay loam.	CL, CH, GC, SC	A-7, A-2-7	0-35	40-80	30-70	25-65	20-60	45-70	25-40
9B---------------- Needleye	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	80-90	25-35	7-15
	7-21	Silty clay loam, silty clay, cherty silty clay loam.	CL	A-6, A-7	0-5	85-100	85-100	80-100	70-90	35-45	15-22
	21-29	Cherty silty clay loam, silty clay loam.	CL	A-6, A-7	0-20	75-100	70-100	65-90	60-90	35-45	15-22
	29-38	Cherty silty clay loam, very cherty silty clay loam.	SC, GC, CL	A-2-6, A-6	5-25	40-75	35-65	30-65	30-60	30-40	11-20
	38-72	Cherty clay, cherty silty clay.	SC, GC, CH, MH	A-2-7, A-7	5-25	50-75	35-65	30-65	30-60	50-75	25-40

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
10---------------- Bado	0-12	Silt loam--------	ML	A-4	0	100	95-100	90-100	75-95	25-35	3-10
	12-16	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	80-100	30-40	15-25
	16-28	Clay, silty clay	CL, CH	A-7	0	95-100	85-100	80-100	75-100	45-70	30-45
	28-51	Silt loam, silty clay loam, cherty silty clay loam.	CL	A-6	0	65-95	60-95	55-90	50-90	30-40	11-18
	51-76	Very cherty silty clay loam, very cherty silty clay.	CL, CH, SC, GC	A-6, A-7	0	55-80	40-70	35-70	35-70	35-60	20-35
11B--------------- Sampsel	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-99	35-50	15-25
	13-66	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	97-100	95-100	52-75	35-47
16B--------------- Barco	0-11	Fine sandy loam	ML, SM, SM-SC, CL-ML	A-4	0	100	100	70-85	40-55	15-25	2-7
	11-37	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	85-100	85-100	80-98	45-80	25-40	11-22
	37-60	Weathered bedrock.									
21B--------------- Peridge	0-9	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-90	80-85	<20	NP-5
	9-45	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	80-95	30-40	11-20
	45-72	Silty clay, clay, cherty clay.	CL, SC, GC	A-7, A-6	0	55-100	50-100	45-90	40-85	35-50	15-25
23B--------------- Bolivar	0-11	Fine sandy loam	ML, SM	A-4	0	100	90-100	70-95	40-55	20-30	NP-5
	11-32	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-10	85-100	85-100	70-95	45-80	25-40	10-25
	32-60	Weathered bedrock									
24---------------- Parsons	0-14	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	96-100	96-100	80-97	20-37	1-12
	14-66	Silty clay loam, clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	96-100	96-100	80-99	37-70	15-40
26D*-------------- Collinsville	0-10	Fine sandy loam	SM, SC, ML, CL	A-4	0-3	80-100	60-100	60-95	36-75	<30	NP-10
	10-13	Fine sandy loam, loam, gravelly fine sandy loam.	SM, SC, ML, CL	A-4	3-40	80-100	60-100	60-95	36-75	<30	NP-10
	13	Unweathered bedrock.									
27D*-------------- Basehor	0-13	Stony fine sandy loam, fine sandy loam.	ML, SM	A-4	15-40	80-100	75-95	70-90	40-75	<30	NP-6
	13	Unweathered bedrock.									

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
30C-------------- Keeno	0-17	Cherty silt loam	SM, GC, GM, SC	A-2-4, A-4	0-35	45-90	35-75	30-70	30-65	15-25	2-10
	17-30	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC, GP-GC	A-2-4, A-2-6, A-6, A-4	0-35	10-50	10-50	5-40	5-40	20-35	5-15
	30-45	Very cherty silt loam, very cherty silty clay loam.	GC, GP-GC	A-2, A-6, A-7	15-55	10-50	10-50	5-40	5-40	30-45	11-20
	45-72	Very cherty clay, very cherty silty clay.	CL, CH, GC, SC	A-2-7, A-7	0-40	40-80	30-70	25-65	20-60	45-70	25-40
32C*:											
Freeburg---------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	90-100	15-35	5-15
	10-13	Silty clay loam	CL	A-6, A-7	0	100	100	85-100	85-100	30-45	15-25
	13-34	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	85-100	70-100	30-45	15-25
	34-72	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	85-100	85-100	30-45	15-25
Alsup-----------	0-6	Silt loam--------	CL	A-6	0-20	85-100	80-100	80-100	80-100	30-40	11-20
	6-10	Silty clay loam, silty clay.	CL	A-7	0-15	90-100	85-100	85-100	85-100	40-50	20-30
	10-33	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-15	90-100	85-100	85-100	85-100	40-60	25-40
	33-60	Silty clay loam, silty clay, shaly silty clay loam.	CL, CH	A-7	0-20	85-100	80-100	80-100	80-100	40-60	25-40
33B*:											
Keeno-----------	0-11	Cherty silt loam	SM, GC, GM, SC	A-2-4, A-4	0-35	45-90	35-75	30-70	30-65	15-25	2-10
	11-28	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC, GP-GC	A-2-4, A-2-6, A-6, A-4	0-35	10-50	10-50	5-40	5-40	20-35	5-15
	28-39	Very cherty silt loam, very cherty silty clay loam.	GC, GP-GC	A-2, A-6, A-7	15-55	10-50	10-50	5-40	5-40	30-45	11-20
	39-60	Very cherty clay, very cherty silty clay, cherty clay.	CL, CH, GC, SC	A-2-7, A-7	5-40	40-80	30-70	25-65	20-60	45-70	25-40
Eldon-----------	0-8	Cherty silt loam	ML, CL-ML, CL	A-4	5-25	70-95	65-90	60-85	55-80	20-30	2-8
	8-19	Very cherty silty clay loam, cherty silty clay loam.	GC, GP-GC	A-2-7, A-7	5-15	20-50	15-45	15-40	10-40	40-50	25-30
	19-72	Silty clay, cherty clay, very cherty clay	CL, CH	A-7	0-15	80-100	65-100	65-95	65-95	45-65	25-35
35D*:											
Clarksville-----	0-13	Cherty silt loam, very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2-4, A-2-6	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	13-30	Very cherty silty clay loam, very cherty silty clay.	GC, SC, SP-SC, GP-GC	A-2-6, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
	30-72	Very cherty silty clay, very cherty clay.	GC, SC, GP-GC, SP-SC	A-2-7, A-7	5-20	30-70	10-60	10-50	10-45	55-75	35-45

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
35D*:											
Nixa	0-8	Cherty silt loam, very cherty silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<25	NP-8
	8-22	Very cherty silt loam, very cherty silty clay loam, very cherty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	22-37	Very cherty silt loam, very cherty silty clay loam, very cherty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	37-72	Very cherty silty clay loam, very cherty silty clay loam, very cherty clay loam, very cherty clay.	GM, GC, GP-GM	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
40E Alsup	0-8	Very stony silt loam.	CL	A-6	15-30	65-100	60-100	60-100	60-100	30-40	11-20
	8-19	Flaggy silty clay loam, silty clay, silty clay loam.	CL, GC	A-7, A-2-7	0-15	80-100	45-100	75-100	45-100	40-50	20-30
	19-34	Cherty silty clay loam, silty clay, clay.	CL, CH, GC	A-7	0-15	60-100	45-100	50-100	45-100	40-60	25-40
	34-48	Silty clay loam, shaly silty clay, silty clay.	CL, CH	A-7	0-15	60-100	50-100	50-100	50-100	40-60	25-40
	48-60	Weathered bedrock									
43D Goss	0-8	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	8-20	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	20-72	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
44E*:											
Goss	0-4	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	4-9	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	9-60	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
Gasconade	0-11	Stony silty clay loam.	CL	A-6	3-70	70-85	70-85	60-75	55-65	30-40	15-25
	11	Unweathered bedrock.									

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
45E-------------- Clarksville	0-16	Cherty silt loam	GC, SC, SM-SC, GP-GC	A-2-4, A-2-6	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	16-45	Very cherty silty clay loam, very cherty silty clay.	GC, SC, SP-SC, GP-GC	A-2-6, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
	45-72	Very cherty silty clay, very cherty clay.	GC, SC, GP-GC, SP-SC	A-2-7, A-7	5-20	30-70	10-60	10-50	10-45	55-75	35-45
50C-------------- Nixa	0-6	Cherty silt loam	GM, SM, GC, SC	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<25	NP-8
	6-18	Very cherty silt loam, very cherty silty clay loam, very cherty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	18-41	Very cherty silt loam, very cherty silty clay loam, very cherty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	41-72	Very cherty silt loam, very cherty silty clay loam, very cherty clay loam, cherty clay.	GM, GC, GP-GM	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
53B*:											
Wilderness------	0-16	Cherty silt loam, very cherty silt loam.	SM-SC, SC, SP-SC, GC	A-1, A-4, A-2-4	0-10	60-85	50-75	20-50	10-40	20-30	5-10
	16-24	Cherty silty clay, cherty clay.	GC, GP-GC, SC, SP-SC	A-6, A-2-6	5-15	40-70	20-60	10-50	10-40	25-40	10-20
	24-34	Very cherty silt loam, very cherty silty clay loam.	GM-GC, GC, GP-GC	A-1, A-2-4, A-2-6	10-40	30-60	10-45	10-40	5-35	20-40	5-15
	34-64	Cherty silty clay, cherty clay.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25
Goss------------	0-8	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	8-24	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	24-60	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
54--------------- Lanton	0-10	Silt loam--------	ML, CL	A-4, A-6	0	100	95-100	90-100	80-95	25-38	8-15
	10-29	Silt loam, silty clay loam.	ML, CL, ML	A-4, A-6	0	100	95-100	85-100	80-95	30-38	8-16
	29-63	Clay, silty clay, silty clay loam.	MH, CH, CL, ML	A-6, A-7	0	100	95-100	85-100	75-95	40-55	18-28
55--------------- Huntington	0-12	Silt loam--------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
	12-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
56--------------- Osage	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-50	10-25
	13-68	Silty clay, clay	CH	A-7	0	100	100	100	95-100	50-80	30-55

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
61B-------------- Hoberg	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	85-100	75-100	70-95	65-90	25-35	7-15
	7-22	Silt loam, silty clay loam, cherty silty clay loam.	SC, CL, GC	A-6	0-10	60-95	50-90	45-85	40-80	30-40	11-20
	22-47	Very cherty silty clay loam, very cherty silt loam.	GC, SC	A-2-6, A-6	0-40	40-85	35-65	20-50	20-45	30-40	11-20
	47-72	Very cherty clay, very cherty silty clay.	GC, SC, MH, CH	A-7, A-2-7	0-25	40-85	35-65	30-65	25-60	50-75	25-40
76--------------- Hepler	0-30	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	20-35	NP-15
	30-65	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
81B-------------- Viraton	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-95	60-75	20-30	5-11
	7-22	Silt loam, silty clay loam, cherty silty clay loam.	CL	A-4, A-6	0-5	85-100	65-100	60-95	55-75	25-35	8-15
	22-34	Cherty silt loam, very cherty silt loam, very cherty silty clay loam.	SC, CL, GC	A-2-4, A-2-6, A-4, A-6	0-10	50-85	35-65	30-65	30-60	25-35	8-15
	34-72	Cherty silt loam, cherty silty clay loam, cherty clay.	SC, CL, GC	A-2-6, A-2-7, A-6, A-7	0-10	40-85	35-65	25-65	25-60	30-48	11-25
83D*: Gasconade--------	0-7	Flaggy clay loam	CL	A-6	20-70	70-85	70-85	60-75	55-65	30-40	15-25
	7-15	Flaggy silty clay, flaggy clay.	GC	A-2-7	20-70	40-50	40-50	30-40	20-35	55-65	35-45
	15	Unweathered bedrock.									
Rock outcrop.											
94--------------- Cedargap	0-18	Cherty silt loam	SM, GM	A-1, A-2-4, A-4	2-15	40-85	30-75	20-60	15-50	25-35	3-9
	18-65	Cherty silt loam, cherty silty clay loam, very cherty silty clay loam.	GC	A-2-6, A-6	5-20	25-50	20-50	15-45	15-40	30-40	15-25
95--------------- Cedargap	0-20	Silt loam--------	ML	A-4	0-5	90-100	85-95	75-95	70-95	25-35	3-9
	20-72	Cherty silty clay loam, very cherty silty clay loam, very cherty silty clay.	GC	A-2-6, A-6	5-20	25-50	20-50	15-45	15-40	30-40	15-25
240-------------- Gerald	0-12	Silt loam--------	CL	A-6	0-5	95-100	85-100	80-95	75-90	30-40	11-20
	12-24	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	85-100	70-100	65-95	60-90	43-55	21-30
	24-44	Silt loam, silty clay loam, cherty silty clay loam.	SC, CL, GC	A-2-6, A-2-7, A-6, A-7	0-5	65-95	35-85	30-80	30-70	35-45	14-21
	44-72	Cherty clay, cherty silty clay, cherty silty clay loam, very cherty clay	SC, GC	A-2-7, A-2-6, A-7	5-15	40-80	35-65	35-65	30-60	43-65	21-39

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
241B*:											
Parsons	0-16	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	96-100	96-100	80-97	20-37	1-12
	16-64	Clay loam, silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	96-100	96-100	80-99	37-70	15-40
Sampsel	0-7	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-99	35-50	15-25
	7-60	Silty clay loam, silty clay, clay, clay loam.	CH	A-7	0	100	100	97-100	95-100	52-75	35-47
245 Carytown	0-17	Silt loam	CL-ML, CL	A-4, A-6	0	100	95-100	95-100	80-95	20-30	5-15
	17-62	Clay, silty clay.	CH	A-7	0	100	95-100	90-100	90-100	51-70	30-45
921*:											
Secesh	0-15	Silt loam	ML	A-4	0-10	85-100	80-100	75-95	60-90	20-30	NP-7
	15-23	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0-10	80-100	75-100	70-95	60-90	25-35	5-12
	23-46	Cherty silty clay loam, cherty silt loam, silty clay loam.	CL, GC, SC	A-6	0-10	65-90	55-80	50-75	40-65	30-40	11-20
	46-60	Very cherty sandy clay, very cherty sandy clay loam, very cherty silty clay loam.	GC, SC	A-4, A-6 A-2-6	10-20	50-75	35-65	25-45	20-40	30-40	11-20
Cedargap	0-8	Silt loam	ML	A-4	0-15	90-100	85-95	75-95	70-95	25-35	3-9
	8-30	Cherty silt loam, cherty loam.	SM, GM	A-1, A-2-4, A-4	2-15	40-85	30-75	20-60	15-50	25-35	3-9
	30-60	Cherty silt loam, cherty clay loam, very cherty clay loam loam.	GC	A-2-6, A-6	5-20	25-50	20-50	15-45	15-40	30-40	15-25
931*:											
Waben	0-18	Cherty silt loam	GM, GM-GC, GP-GM	A-1, A-2	0-15	20-53	15-50	10-40	5-35	<30	NP-7
	18-72	Very cherty silt loam, very cherty silty clay loam, silty clay loam, very cherty loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	0-15	20-53	15-50	10-40	5-35	20-40	3-20
Cedargap	0-19	Cherty silt loam	SM, GM	A-1, A-2-4, A-4	2-15	40-85	30-75	20-60	15-50	25-35	3-9
	19-50	Very cherty silt loam, cherty loam.	SM, GM	A-1, A-2-4, A-4	2-15	40-85	30-75	20-60	15-50	25-35	3-9
	50-72	Cherty silt loam, cherty silty clay loam, cherty clay loam.	GC	A-2-6, A-6	5-20	25-50	20-50	15-45	15-40	30-40	15-25
940*. Dumps-Orthents											
941*. Pits and Dumps											

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
943*. Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
1B----------------Newtonia	0-10	10-24	1.30-1.55	0.6-2.0	0.15-0.24	5.6-6.5	Low----------	0.37	5	5	1-3
	10-21	20-35	1.40-1.70	0.6-2.0	0.16-0.22	5.1-6.5	Moderate-----	0.37			
	21-27	27-35	1.45-1.70	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.32			
	27-54	32-45	1.35-1.65	0.6-2.0	0.12-0.20	5.1-6.0	High---------	0.32			
	54-72	32-45	1.35-1.65	0.6-2.0	0.12-0.20	5.1-7.3	High---------	0.32			
2B----------------Pembroke	0-8	12-27	1.10-1.30	0.6-2.0	0.18-0.23	4.5-6.0	Low----------	0.32	4	6	2-3
	8-46	27-35	1.20-1.40	0.6-2.0	0.14-0.19	4.5-6.0	Low----------	0.32			
	46-72	40-70	1.40-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.32			
3D----------------Eldon	0-10	7-27	1.20-1.40	2.0-6.0	0.13-0.18	5.1-6.0	Low----------	0.24	2	8	.5-2
	10-31	35-50	1.40-1.50	0.6-2.0	0.03-0.08	4.5-6.0	Moderate-----	0.24			
	31-72	35-50	1.40-1.55	0.6-2.0	0.10-0.14	5.1-6.5	Moderate-----	0.24			
5C----------------Wilderness	0-10	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-7.3	Low----------	0.28	2	8	.5-2
	10-21	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low----------	0.28			
	21-56	20-35	1.70-2.00	0.06-0.2	---	4.5-6.0	Low----------	0.28			
	56-72	40-70	1.50-1.70	0.2-0.6	---	4.5-6.0	Moderate-----	0.28			
6B----------------Creldon	0-9	15-25	1.20-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	4	5	1-3
	9-24	35-45	1.30-1.50	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.37			
	24-36	25-35	1.50-1.70	0.06-0.2	0.07-0.14	3.6-5.0	Low----------	0.37			
	36-67	35-70	1.10-1.40	0.6-2.0	0.05-0.10	3.6-6.0	Moderate-----	0.37			
9B----------------Needleye	0-7	15-25	1.30-1.50	0.6-2.0	0.15-0.19	4.5-7.3	Low----------	0.37	4	6	.5-2
	7-21	25-35	1.50-1.70	0.2-0.6	0.12-0.16	3.6-5.5	Low----------	0.37			
	21-29	25-35	1.30-1.50	0.2-0.6	0.08-0.12	3.6-5.0	Low----------	0.37			
	29-38	20-30	1.10-1.40	0.06-0.2	0.01-0.05	3.6-6.0	Low----------	0.28			
	38-72	40-75	1.10-1.40	0.2-0.6	0.03-0.08	3.6-6.0	Moderate-----	0.28			
10----------------Bado	0-12	15-25	1.20-1.50	0.2-0.6	0.22-0.24	3.6-6.0	Low----------	0.43	4	6	.5-2
	12-16	30-40	1.30-1.50	0.06-0.2	0.12-0.17	3.6-5.5	Moderate-----	0.43			
	16-28	35-55	1.30-1.50	0.06-0.2	0.09-0.11	3.6-5.5	High---------	0.43			
	28-51	25-35	1.50-1.70	<0.06	0.07-0.10	3.6-5.5	Moderate-----	0.43			
	51-76	35-70	1.30-1.60	0.06-0.2	0.05-0.10	3.6-6.0	Moderate-----	0.43			
11B----------------Sampsel	0-13	25-35	1.30-1.50	0.2-0.6	0.21-0.24	5.6-7.3	Moderate-----	0.37	3	4	3-4
	13-66	36-48	1.40-1.60	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.37			
16B----------------Barco	0-11	10-20	1.40-1.55	2.0-6.5	0.16-0.18	5.1-6.5	Low----------	0.28	4	3	1-3
	11-37	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-6.5	Moderate-----	0.28			
	37-60	---	---	---	---	---	-------------	----			
21B----------------Peridge	0-9	10-20	1.25-1.45	0.6-2.0	0.16-0.24	4.5-6.5	Low----------	0.37	5	5	1-3
	9-45	20-34	1.25-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.32			
	45-72	40-60	1.15-1.35	0.6-2.0	0.09-0.18	4.5-6.0	Moderate-----	0.24			
23B----------------Bolivar	0-11	12-18	1.20-1.45	2.0-6.0	0.16-0.18	5.1-6.5	Low----------	0.24	4	3	.5-2
	11-32	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-6.0	Moderate-----	0.32			
	32-60	---	---	---	---	---	-------------	----			
24----------------Parsons	0-14	15-25	1.30-1.50	0.6-2.0	0.16-0.24	5.1-7.3	Low----------	0.43	4	6	.5-1
	14-66	35-60	1.40-1.70	<0.06	0.14-0.22	5.1-7.8	High---------	0.43			
26D*--------------Collinsville	0-10	5-20	1.30-1.65	2.0-6.0	0.12-0.16	5.1-6.5	Low----------	0.32	2	3	1-2
	10-13	5-20	1.30-1.65	2.0-6.0	0.09-0.13	5.1-6.5	Low----------	0.20			
	13	---	---	---	---	---	-------------	----			
27D*--------------Basehor	0-13	12-20	1.20-1.40	2.0-6.0	0.13-0.18	5.1-6.5	Low----------	0.24	2	8	<2
	13	---	---	---	---	---	-------------	----			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
30C: Keeno	0-17	15-25	1.30-1.60	2.0-6.0	0.06-0.15	4.5-7.3	Low	0.24	4	7	1-3
	17-30	25-35	1.50-1.80	2.0-6.0	0.02-0.10	3.6-5.5	Low	0.24			
	30-45	25-35	1.60-1.90	0.06-0.2	0.01-0.05	3.6-5.5	Low	0.24			
	45-72	40-80	1.10-1.40	0.6-2.0	0.04-0.10	3.6-5.5	Moderate	0.24			
32C*:											
Freeburg	0-10	12-25	1.20-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	6	.5-2
	10-13	27-35	1.40-1.50	0.6-2.0	0.18-0.20	5.1-6.0	Moderate	0.37			
	13-34	27-35	1.40-1.50	0.2-0.6	0.15-0.19	4.5-6.5	Moderate	0.37			
	34-72	27-32	1.35-1.50	0.2-0.6	0.16-0.20	5.1-6.5	Moderate	0.37			
Alsup	0-6	20-30	1.20-1.50	0.6-2.0	0.16-0.20	5.1-7.3	Low	0.37	3	6	.5-2
	6-10	35-45	1.20-1.50	0.2-0.6	0.12-0.17	4.5-6.0	Moderate	0.37			
	10-33	35-50	1.30-1.50	0.2-0.6	0.10-0.17	3.6-7.8	High	0.37			
	33-60	35-50	1.40-1.70	0.2-0.6	0.06-0.12	3.6-7.8	High	0.37			
33B*:											
Keeno	0-11	15-25	1.30-1.60	2.0-6.0	0.06-0.15	4.5-7.3	Low	0.24	4	7	1-3
	11-28	25-35	1.50-1.80	2.0-6.0	0.02-0.10	3.6-5.5	Low	0.24			
	28-39	25-35	1.60-1.90	0.06-0.2	0.01-0.05	3.6-5.5	Low	0.24			
	39-60	40-80	1.10-1.40	0.6-2.0	0.04-0.10	3.6-5.5	Moderate	0.24			
Eldon	0-8	7-27	1.20-1.40	2.0-6.0	0.13-0.18	5.1-6.0	Low	0.24	2	8	.5-2
	8-19	35-50	1.40-1.50	0.6-2.0	0.03-0.08	5.1-6.0	Moderate	0.24			
	19-72	35-50	1.40-1.55	0.6-2.0	0.10-0.14	5.1-6.5	Moderate	0.24			
35D*:											
Clarksville	0-13	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low	0.28	2	8	1-2
	13-30	28-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low	0.28			
	30-72	40-75	1.40-1.80	2.0-6.0	0.05-0.08	4.5-5.5	Low	0.28			
Nixa	0-8	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-6.0	Low	0.43	2	8	1-3
	8-22	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43			
	22-37	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43			
	37-72	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37			
40E: Alsup	0-8	20-30	1.20-1.50	0.6-2.0	0.12-0.18	5.1-7.3	Low	0.28	3	8	.5-2
	8-19	35-45	1.30-1.50	0.2-0.6	0.08-0.15	4.5-6.0	Moderate	0.28			
	19-34	35-50	1.30-1.50	0.2-0.6	0.08-0.15	3.6-7.8	High	0.28			
	34-48	35-50	1.40-1.70	0.2-0.6	0.04-0.10	3.6-7.8	High	0.28			
	48-60	---	---	---	---	---	-------------	----			
43D: Goss	0-8	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-7.3	Low	0.24	2	6	1-2
	8-20	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-7.3	Low	0.24			
	20-72	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.24			
44E*:											
Goss	0-4	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-7.3	Low	0.24	2	6	1-2
	4-9	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-7.3	Low	0.24			
	9-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.24			
Gasconade	0-11	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate	0.20	2	8	2-4
	11	---	---	---	---	---	-------------	----			
45E: Clarksville	0-16	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low	0.28	2	8	1-2
	16-45	28-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low	0.28			
	45-72	40-75	1.40-1.80	2.0-6.0	0.05-0.08	4.5-5.5	Low	0.28			
50C: Nixa	0-6	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-6.0	Low	0.43	2	8	1-3
	6-18	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43			
	18-41	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43			
	41-72	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
53B*:											
Wilderness	0-16	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-7.3	Low	0.28	2-1	8	.5-2
	16-24	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low	0.28			
	24-34	20-35	1.70-2.00	0.06-0.2	---	4.5-5.0	Low	0.28			
	34-64	40-70	1.50-1.70	0.2-0.6	---	4.5-5.5	Moderate	0.28			
Goss	0-8	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-7.3	Low	0.24	2	6	1-2
	8-24	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-7.3	Low	0.24			
	24-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.24			
54 Lanton	0-10	20-30	1.30-1.55	0.6-2.0	0.18-0.22	6.1-7.3	Low	0.37	5	6	2-6
	10-29	20-35	1.40-1.60	0.2-0.6	0.17-0.22	6.1-7.3	Low	0.37			
	29-63	20-35	1.40-1.60	0.2-0.6	0.12-0.18	6.1-7.3	Moderate	0.37			
55 Huntington	0-12	18-30	1.10-1.30	0.6-2.0	0.18-0.24	5.6-7.8	Low	0.32	5	6	3-6
	12-60	18-30	1.30-1.50	0.6-2.0	0.10-0.16	5.6-7.8	Low	0.32			
56 Osage	0-13	35-40	1.45-1.65	<0.06	0.21-0.23	5.1-7.3	High	0.28	5	4	1-4
	13-68	40-60	1.50-1.70	<0.06	0.08-0.12	5.6-7.8	Very high	0.28			
61B Hoberg	0-7	15-25	1.30-1.60	0.6-2.0	0.13-0.18	5.1-7.3	Low	0.37	4	6	1-3
	7-22	20-30	1.50-1.70	0.6-2.0	0.08-0.14	5.1-6.5	Low	0.37			
	22-47	20-30	1.60-1.90	0.06-0.2	0.01-0.05	3.6-6.0	Low	0.28			
	47-72	40-75	1.10-1.40	0.2-0.6	0.04-0.10	3.6-6.0	Moderate	0.28			
76 Hepler	0-30	15-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-6.5	Low	0.37	5	6	.5-2
	30-65	27-35	1.30-1.50	0.2-0.6	0.18-0.20	4.5-6.5	Moderate	0.37			
81B Viraton	0-7	15-25	1.30-1.50	0.6-2.0	0.15-0.18	4.5-6.5	Low	0.43	4	6	.5-2
	7-22	20-30	1.30-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low	0.43			
	22-34	20-30	1.60-1.80	0.06-0.2	0.01-0.05	3.6-5.5	Low	0.43			
	34-72	25-45	1.10-1.40	0.2-0.6	0.02-0.06	4.5-5.5	Moderate	0.28			
83D*:											
Gasconade	0-7	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate	0.20	2	8	2-4
	7-15	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate	0.20			
	15	---	---	---	---	---	------------	----			
Rock outcrop.											
94 Cedargap	0-18	12-25	1.20-1.45	2.0-6.0	0.11-0.18	5.6-7.3	Low	0.24	5	8	1-4
	18-65	25-35	1.40-1.55	2.0-6.0	0.04-0.10	5.6-7.3	Low	0.24			
95 Cedargap	0-20	15-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.32	5	6	1-4
	20-72	25-35	1.40-1.55	2.0-6.0	0.04-0.10	5.6-7.3	Low	0.24			
240 Gerald	0-12	20-25	1.30-1.50	0.6-2.0	0.15-0.18	4.5-6.0	Low	0.43	4	6	.5-2
	12-24	35-45	1.40-1.60	<0.06	0.05-0.10	4.5-5.5	High	0.43			
	24-44	25-35	1.60-1.80	<0.06	0.01-0.05	4.5-5.5	Low	0.43			
	44-72	35-60	1.40-1.60	0.2-0.6	0.03-0.08	4.5-5.5	Moderate	0.43			
241B*:											
Parsons	0-16	15-25	1.30-1.50	0.6-2.0	0.16-0.24	5.1-6.5	Low	0.43	4	6	.5-1
	16-64	35-60	1.40-1.70	<0.06	0.14-0.22	5.1-7.8	High	0.43			
Sampsel	0-7	25-35	1.30-1.50	0.2-0.6	0.21-0.24	5.6-7.3	Moderate	0.37	3-2	4	3-4
	7-60	36-48	1.40-1.60	0.06-0.2	0.11-0.13	5.6-7.8	High	0.37			
245 Carytown	0-17	12-25	1.20-1.40	0.6-2.0	0.19-0.24	5.1-7.3	Low	0.43	3	6	1-3
	17-62	40-60	1.45-1.65	<0.06	0.08-0.11	5.6-8.4	High	0.43			
921*:											
Secesh	0-15	15-25	1.10-1.30	0.6-2.0	0.16-0.20	5.6-6.5	Low	0.32	3	5	<2
	15-23	20-30	1.20-1.40	0.6-2.0	0.13-0.19	4.5-6.0	Low	0.32			
	23-46	25-35	1.20-1.40	0.6-2.0	0.09-0.14	4.5-6.0	Low	0.32			
	46-60	25-35	1.30-1.50	0.6-2.0	0.05-0.09	4.5-6.0	Low	0.24			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
921*:											
Cedargap--------	0-8	15-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	6	1-4
	8-30	12-27	1.30-1.50	2.0-6.0	0.10-0.15	5.6-7.3	Low-----------	0.24			
	30-60	25-35	1.40-1.55	2.0-6.0	0.04-0.10	5.6-7.3	Low-----------	0.24			
931*:											
Waben-----------	0-18	16-27	1.10-1.30	2.0-6.0	0.05-0.15	5.1-6.5	Low-----------	0.28	5	6	1-4
	18-72	16-30	1.30-1.50	2.0-6.0	0.05-0.15	5.1-6.5	Low-----------	0.24			
Cedargap--------	0-19	12-25	1.20-1.45	2.0-6.0	0.11-0.18	5.6-7.3	Low-----------	0.24	5	8	1-4
	19-50	12-27	1.30-1.50	2.0-6.0	0.10-0.15	5.6-7.3	Low-----------	0.24			
	50-72	25-35	1.40-1.55	2.0-6.0	0.04-0.10	5.6-7.3	Low-----------	0.24			
940*. Dumps-Orthents											
941*. Pits and Dumps											
943*. Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[See text for definitions of terms such as "occasional," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1B----------------- Newtonia	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
2B----------------- Pembroke	B	None---------	---	---	>6.0	---	---	>60	---	High------	Low-------	Moderate.
3D----------------- Eldon	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
5C----------------- Wilderness	C	None---------	---	---	1.0-2.0	Perched	Dec-Mar	>60	---	Moderate	Low-------	High.
6B----------------- Creldon	C	None---------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High------	High.
9B----------------- Needleye	C	None---------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
10----------------- Bado	D	None---------	---	---	0-2.0	Perched	Dec-Apr	>60	---	High------	High------	High.
11B----------------- Sampsel	D	None---------	---	---	0-1.5	Perched	Nov-Apr	40-70	Soft	High------	High------	Low.
16B----------------- Barco	B	None---------	---	---	>6.0	---	---	20-40	Soft	---	Low-------	Moderate.
21B----------------- Peridge	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
23B----------------- Bolivar	B	None---------	---	---	>6.0	---	---	20-40	Soft	---	Low-------	Moderate.
24----------------- Parsons	D	None---------	---	---	0.5-1.5	Perched	Dec-Apr	>60	---	---	High------	Moderate.
26D*--------------- Collinsville	C	None---------	---	---	>6.0	---	---	4-20	Hard	---	Low-------	Moderate.
27D*--------------- Basehor	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low-------	Moderate.
30C----------------- Keeno	C	None---------	---	---	2.5-4.0	Perched	Dec-Mar	>60	---	Moderate	Moderate	High.
32C*:												
Freeburg----------	C	None to occasional.	Brief	Apr-Jul	1.5-3.0	Perched	Nov-May	>60	---	High------	Moderate	High.
Alsup-------------	C	None---------	---	---	2.5-4.0	Perched	Dec-Mar	>40	Soft	Moderate	High------	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
33B*:												
Keeno-------------	C	None---------	---	---	2.5-4.0	Perched	Dec-Mar	>60	---	Moderate	Moderate	High.
Eldon-------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
35D*:												
Clarksville-------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Nixa--------------	C	None---------	---	---	>60	---	---	>60	---	---	Moderate	Moderate.
40E--------------- Alsup	C	None---------	---	---	2.5-4.0	Perched	Dec-Mar	>40	Soft	Moderate	High-----	Moderate.
43D--------------- Goss	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
44E*:												
Goss--------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Gasconade---------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
45E--------------- Clarksville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
50C--------------- Nixa	C	None---------	---	---	>60	---	---	>60	---	---	Moderate	Moderate.
53B*:												
Wilderness--------	C	None---------	---	---	1.0-2.0	Perched	Dec-Mar	>60	---	Moderate	Low------	High.
Goss--------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
54---------------- Lanton	D	Frequent-----	Very brief	Jan-May	1.0-2.0	Apparent	Dec-May	>60	---	---	High-----	Low.
55---------------- Huntington	B	Occasional	Brief-----	Jan-May	4.0-6.0	Apparent	Dec-Apr	>60	---	High-----	Low------	Moderate.
56---------------- Osage	D	Occasional	Brief to long.	Nov-May	0-1.0	Perched	Nov-May	>60	---	---	High-----	Moderate.
61B--------------- Hoberg	C	None---------	---	---	1.5-3.0	Perched	Dec-Mar	>60	---	Moderate	Moderate	High.
76---------------- Hepler	B/D	Occasional	Brief-----	Mar-Jul	1.0-3.0	Apparent	Nov-Mar	>60	---	Moderate	High-----	Moderate.
81B--------------- Viraton	C	None---------	---	---	1.5-3.0	Perched	Dec-Mar	>60	---	Moderate	Moderate	High.
83D*:												
Gasconade---------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
Rock outcrop.												

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
94, 95------------ Cedargap	B	Frequent----	Very brief	Nov-Mar	>6.0	---	---	>60	---	Moderate	Low------	Low.
240--------------- Gerald	D	None--------	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	High-----	High.
241B*:												
Parsons----------	D	None--------	---	---	0.5-1.5	Perched	Dec-Apr	>60	---	---	High-----	Moderate.
Sampsel----------	D	None--------	---	---	0-1.5	Perched	Nov-Apr	40-70	Soft	High-----	High-----	Low.
245--------------- Carytown	D	None--------	---	---	0-1.0	Perched	Dec-Apr	>60	---	---	High-----	Moderate.
921*:												
Secesh-----------	B	Occasional	Very brief	Nov-Apr	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Cedargap---------	B	Frequent----	Very brief	Nov-Mar	>6.0	---	---	>60	---	Moderate	Low------	Low.
931*:												
Waben------------	B	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Moderate.
Cedargap---------	B	Frequent----	Very brief	Nov-Mar	>6.0	---	---	>60	---	Moderate	Low------	Low.
940*. Dumps-Orthents												
941*. Pits and Dumps												
943*. Orthents												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Alsup	Fine, mixed, mesic Ultic Hapludalfs
Bado	Fine, mixed, mesic Typic Fragiaqualfs
Barco	Fine-loamy, mixed, thermic Mollic Hapludalfs
Basehor	Loamy, siliceous, mesic Lithic Dystrochrepts
Bolivar	Fine-loamy, mixed, thermic Ultic Hapludalfs
Carytown	Fine, mixed, thermic Albic Natraqualfs
Cedargap	Loamy-skeletal, mixed, mesic Cumulic Hapludolls
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Collinsville	Loamy, siliceous, thermic Lithic Hapludolls
Creldon	Fine, mixed, mesic Mollic Fragiudalfs
Eldon	Clayey-skeletal, mixed, mesic Mollic Paleudalfs
Freeburg	Fine-silty, mixed, mesic Aquic Hapludalfs
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Gerald	Fine, mixed, mesic Umbric Fragiaqualfs
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Hepler	Fine-silty, mixed, thermic Udollic Ochraqualfs
Hoberg	Fine-loamy, siliceous, mesic Mollic Fragiudalfs
Huntington	Fine-silty, mixed, mesic Fluventic Hapludolls
Keeno	Loamy-skeletal, siliceous, mesic Mollic Fragiudalfs
Lanton	Fine-silty, mixed, thermic Cumulic Haplaquolls
Needleye	Fine-silty, mixed, mesic Aquic Fragiudults
Newtonia	Fine-silty, mixed, thermic Typic Paleudolls
Nixa	Loamy-skeletal, siliceous, mesic Glossic Fragiudults
Orthents	Mixed, mesic Udorthents
Osage	Fine, montmorillonitic, thermic Vertic Haplaquolls
Parsons	Fine, mixed, thermic Mollic Albaqualfs
Pembroke	Fine-silty, mixed, mesic Mollic Paleudalfs
Peridge	Fine-silty, mixed, mesic Typic Paleudalfs
Sampsel	Fine, montmorillonitic, mesic, sloping Typic Argiaquolls
Secesh	Fine-loamy, siliceous, mesic Ultic Hapludalfs
Viraton	Fine-loamy, siliceous, mesic Typic Fragiudalfs
Waben	Loamy-skeletal, siliceous, mesic Ultic Hapludalfs
Wilderness	Loamy-skeletal, siliceous, mesic Typic Fragiudalfs

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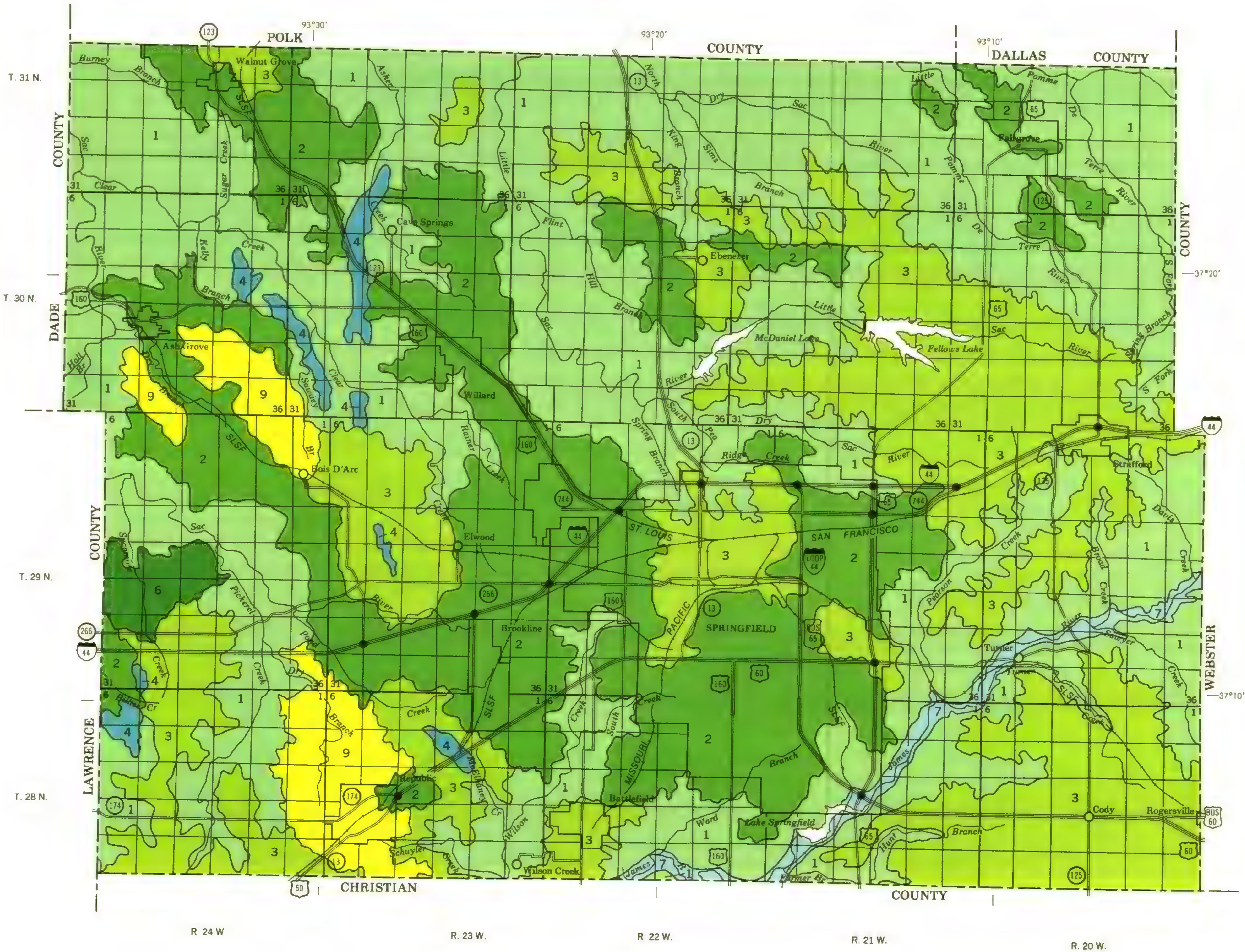


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
GREENE COUNTY, MISSOURI

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SOIL LEGEND

1 Goss-Wilderness-Peridge association: Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on uplands and terraces

2 Pembroke-Eldon-Creldon association: Deep, well drained and moderately well drained, gently sloping to strongly sloping soils; on uplands and terraces

3 Wilderness-Viraton association: Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands and terraces

4 Basehor-Bolivar association: Shallow and moderately deep, well drained, gently sloping to strongly sloping soils; on uplands

5 Hoberg-Keeno-Creldon association*: Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands and terraces

6 Clarksville-Nixa association: Deep, somewhat excessively drained and moderately well drained, gently sloping to steep soils; on uplands

7 Huntington association: Deep, well drained, nearly level soils; on flood plains

8 Creldon-Parsons association*: Deep, moderately well drained and somewhat poorly drained, gently sloping and nearly level soils; on uplands

9 Keeno-Creldon association: Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands

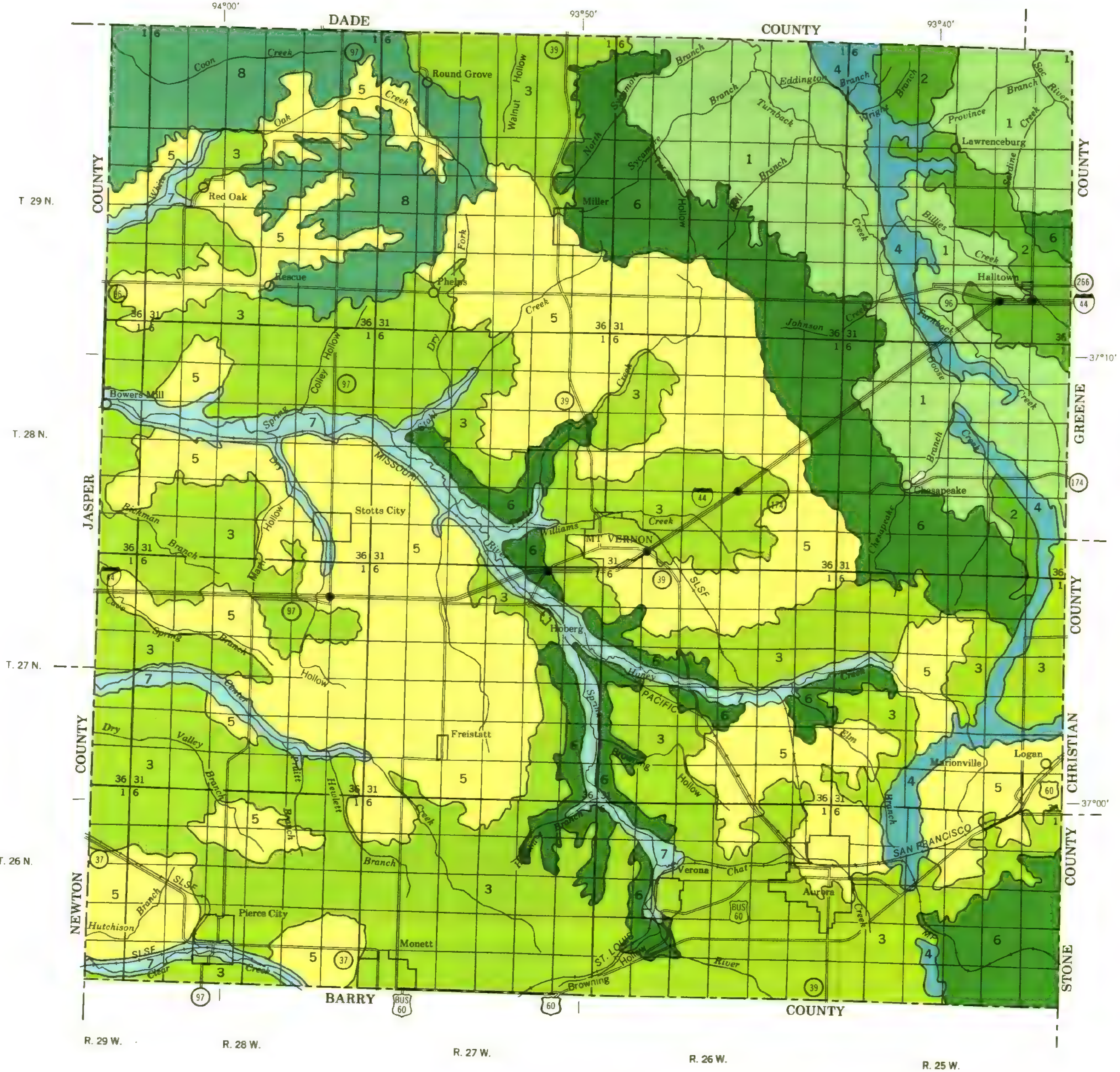
*The Hoberg-Keeno-Creldon association and the Creldon-Parsons association do not occur in Greene County.

Compiled 1981

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
LAWRENCE COUNTY, MISSOURI

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SOIL LEGEND

1	Goss-Wilderness-Peridge association: Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on uplands and terraces
2	Pembroke-Eldon-Creldon association: Deep, well drained and moderately well drained, gently sloping to strongly sloping soils; on uplands and terraces
3	Wilderness-Viraton association: Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands and terraces
4	Basehor-Bolivar association: Shallow and moderately deep, well drained, gently sloping to strongly sloping soils; on uplands
5	Hoberg-Keeno-Creldon association: Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands and terraces
6	Clarksville-Nixa association: Deep, somewhat excessively drained and moderately well drained, gently sloping to steep soils; on uplands
7	Huntington association: Deep, well drained, nearly level soils; on flood plains
8	Creldon-Parsons association: Deep, moderately well drained and somewhat poorly drained, gently sloping and nearly level soils; on uplands
9	Keeno-Creldon association*: Deep, moderately well drained, gently sloping and moderately sloping soils; on uplands

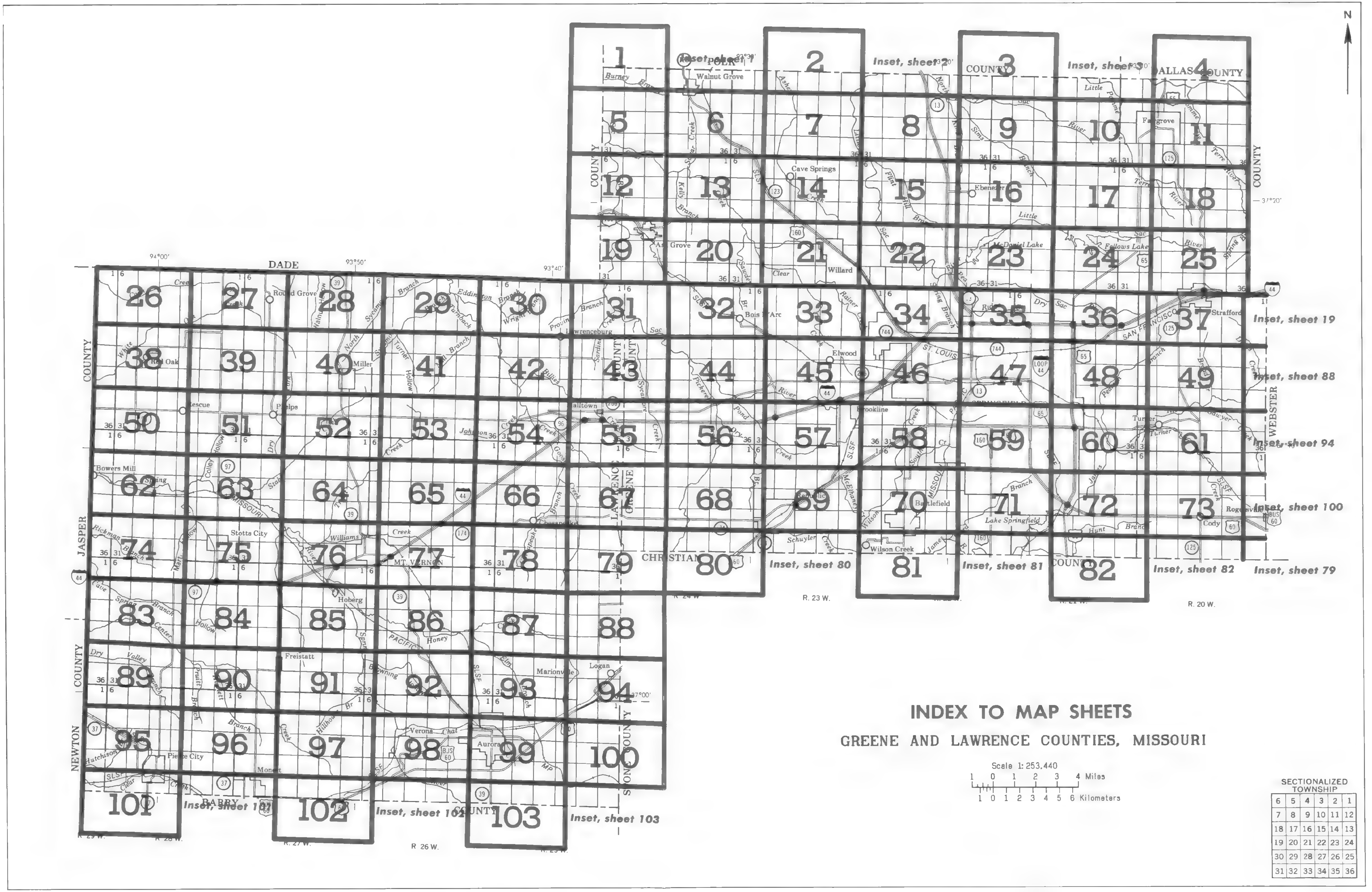
*The Keeno-Creldon association does not occur in Lawrence County.

Compiled 1981

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36


INDEX TO MAP SHEETS
GREENE AND LAWRENCE COUNTIES, MISSOURI
Scale 1: 253,440
1 0 1 2 3 4 Miles
1 0 1 2 3 4 5 6 Kilometers
SECTIONALIZED TOWNSHIP
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
N
Inset, sheet 1
Inset, sheet 2
Inset, sheet 3
Inset, sheet 19
Inset, sheet 88
Inset, sheet 94
Inset, sheet 100
Inset, sheet 79
Inset, sheet 82
Inset, sheet 81
Inset, sheet 80
Inset, sheet 103
Inset, sheet 102
Inset, sheet 101
POLK
DALLAS COUNTY
WEBSTER COUNTY
CHRISTIAN COUNTY
STONE COUNTY
BARRY COUNTY
NEWTON COUNTY
JASPER COUNTY
DADE
LAWRENCE COUNTY
GREENE COUNTY
R. 29 W.
R. 28 W.
R. 27 W.
R. 26 W.
R. 25 W.
R. 24 W.
R. 23 W.
R. 22 W.
R. 21 W.
R. 20 W.
94°00'
93°50'
93°40'
93°30'
93°20'
37°20'
37°00'

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
1B	Newtonia silt loam, 1 to 3 percent slopes
2B	Pembroke silt loam, 1 to 5 percent slopes
3D	Eldon cherty silt loam, 5 to 14 percent slopes
5C	Wilderness cherty silt loam, 2 to 9 percent slopes
6B	Creldon silt loam, 1 to 4 percent slopes
9B	Needleye silt loam, 1 to 3 percent slopes
10	Bado silt loam
11B	Sampsel silty clay loam, 2 to 5 percent slopes
16B	Barco fine sandy loam, 2 to 5 percent slopes
21B	Peridge silt loam, 2 to 5 percent slopes
23B	Bolivar fine sandy loam, 2 to 5 percent slopes
24	Parsons silt loam
26D	Collinsville fine sandy loam, 2 to 14 percent slopes
27D	Basehor stony fine sandy loam, 2 to 14 percent slopes
30C	Keeno cherty silt loam, 2 to 9 percent slopes
32C	Freeburg and Alsup silt loams, 2 to 9 percent slopes
33B	Keeno and Eldon cherty silt loams, 2 to 5 percent slopes
35D	Clarksville-Nixa cherty silt loams, 5 to 14 percent slopes
40E	Alsup very stony silt loam, 9 to 25 percent slopes
43D	Goss cherty silt loam, 5 to 14 percent slopes
44E	Goss-Gasconade complex, 2 to 50 percent slopes
45E	Clarksville cherty silt loam, 14 to 30 percent slopes
50C	Nixa cherty silt loam, 2 to 9 percent slopes
53B	Wilderness and Goss cherty silt loams, 2 to 5 percent slopes
54	Lanton silt loam
55	Huntington silt loam
56	Osage silty clay loam
61B	Hoberg silt loam, 2 to 5 percent slopes
76	Hepler silt loam
81B	Viraton silt loam, 2 to 5 percent slopes
83D	Gasconade-Rock outcrop complex, 2 to 20 percent slopes
94	Cedargap cherty silt loam
95	Cedargap silt loam
240	Gerald silt loam
241B	Parsons and Sampsel silt loams, 1 to 3 percent slopes
245	Carytown silt loam
921	Secesh-Cedargap silt loams
931	Waben-Cedargap cherty silt loams, 0 to 5 percent slopes
940	Dumps-Orthents complex
941	Pits and Dumps
943	Orthents, nearly level to strongly sloping

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

County

Reservation (national forest or park, state forest or park, and large airport)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool

Davis Airstrip — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROAD EMBLEMS & DESIGNATIONS

Interstate — 79

Federal — 410

State — 52

County, farm or ranch — 378

DAMS

Large (to scale)

Medium or small — water

PITS

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Church

School

WATER FEATURES

DRAINAGE

Perennial, single line

Intermittent

Drainage end

LAKES, PONDS AND RESERVOIRS

Perennial — water, w

MISCELLANEOUS WATER FEATURES

Spring

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 21B 5C

ESCARPMENTS

Bedrock (points down slope)

SHORT STEEP SLOPE

DEPRESSION OR SINK

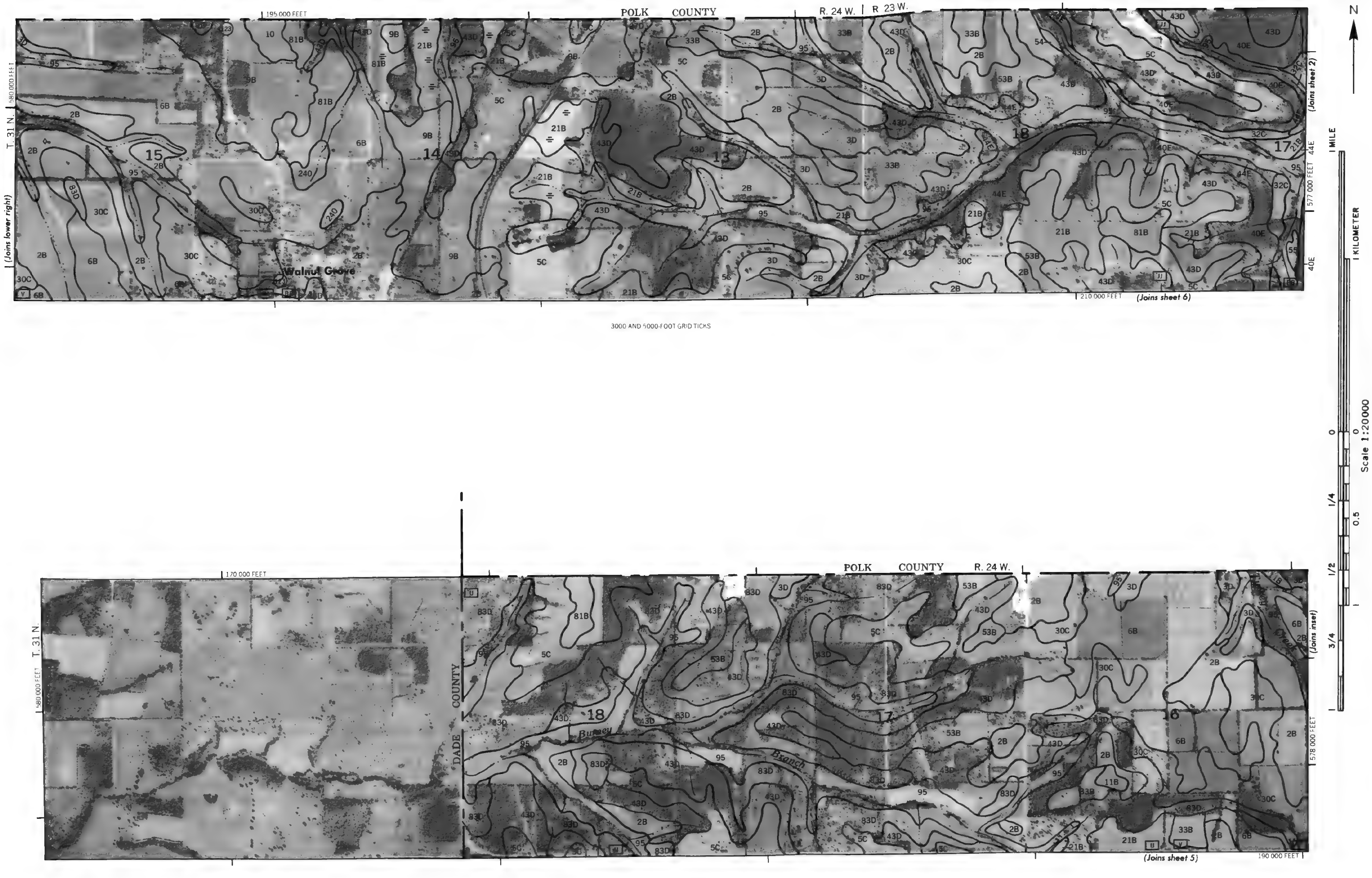
MISCELLANEOUS

Rock outcrop (includes sandstone and shale)

Severely eroded spot

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 1

1



SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 2

N

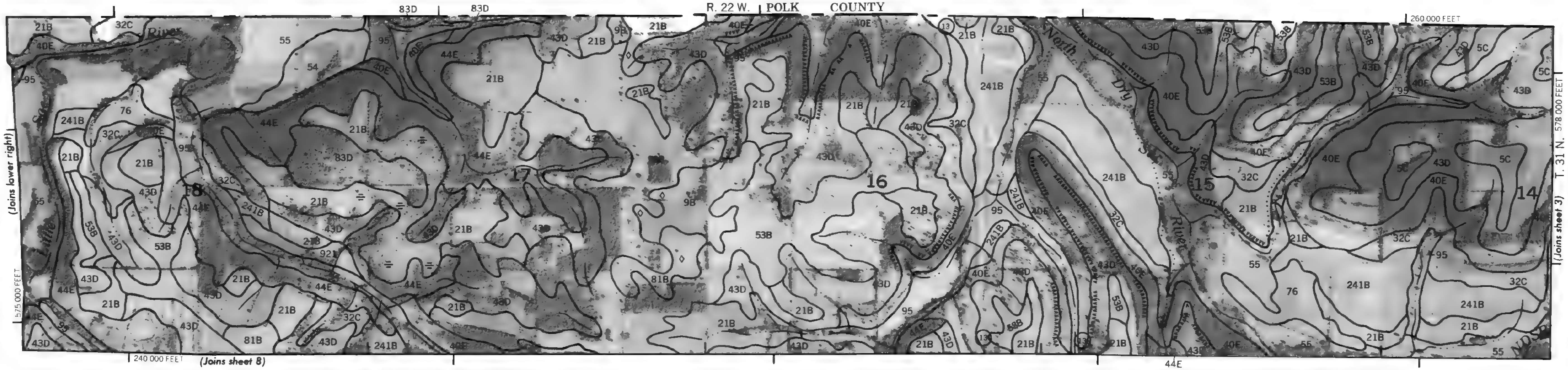
1 MILE

1 KILOMETER

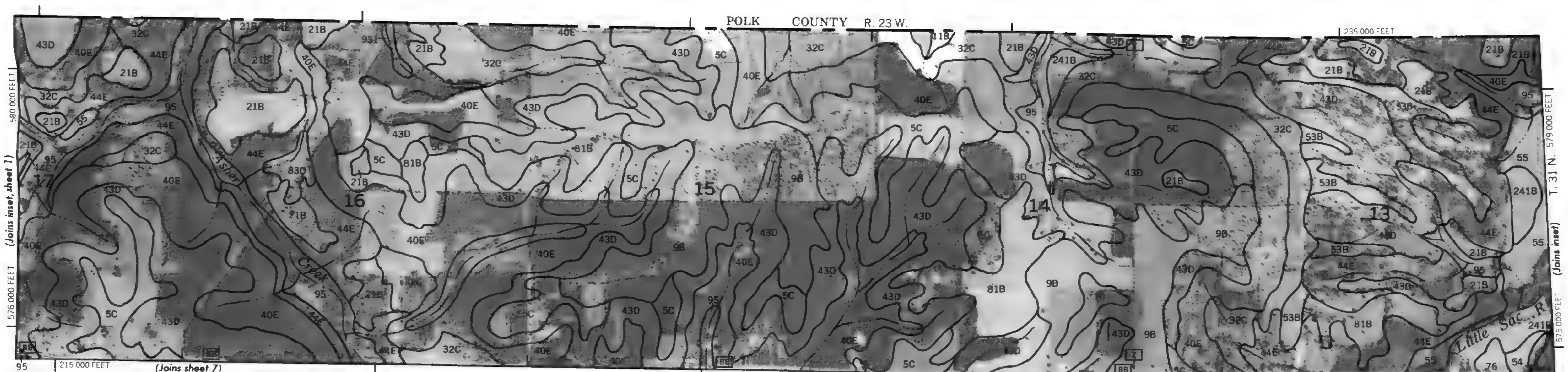
Scale 1:20000

0 1/4 1/2 3/4 1

0 0.5 1



3000 AND 5000-FOOT GRID TICKS



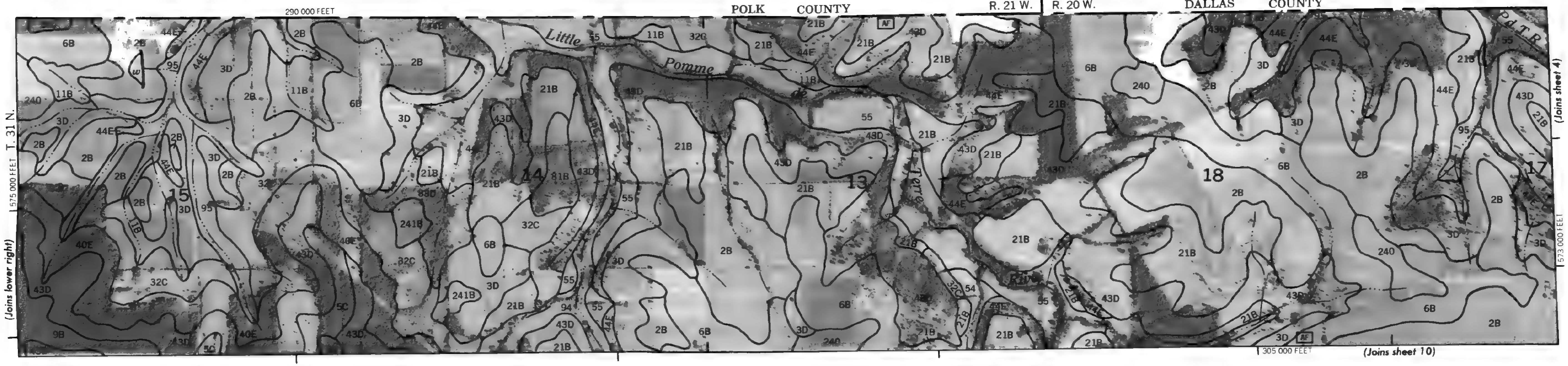
4000 AND 5000 FOOT GRID TICKS

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

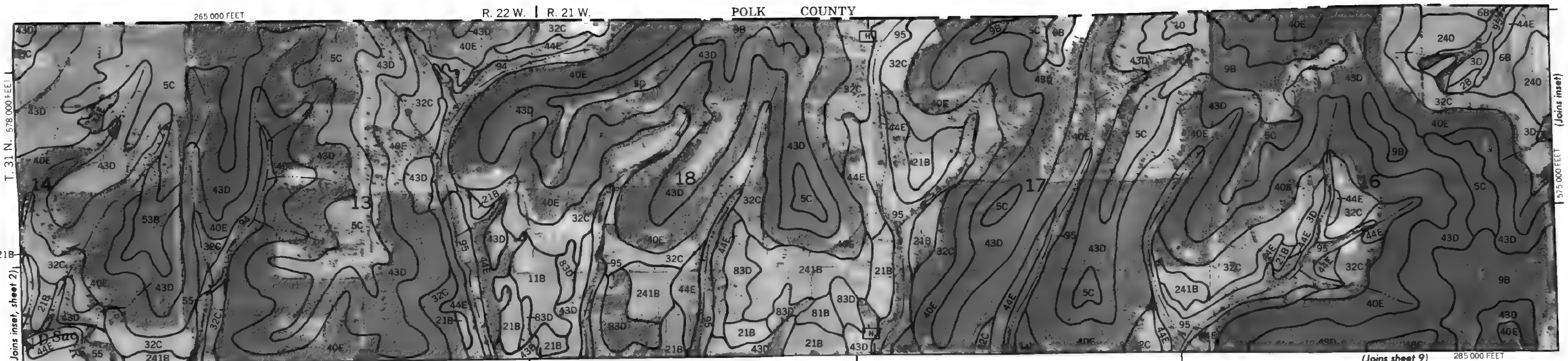
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 3

3

N



2000 AND 5000-FOOT GRID TICKS



3000 AND 5000-FOOT GRID TICKS

1 MILE

1 KILOMETER

0 1/4 1/2 3/4 1

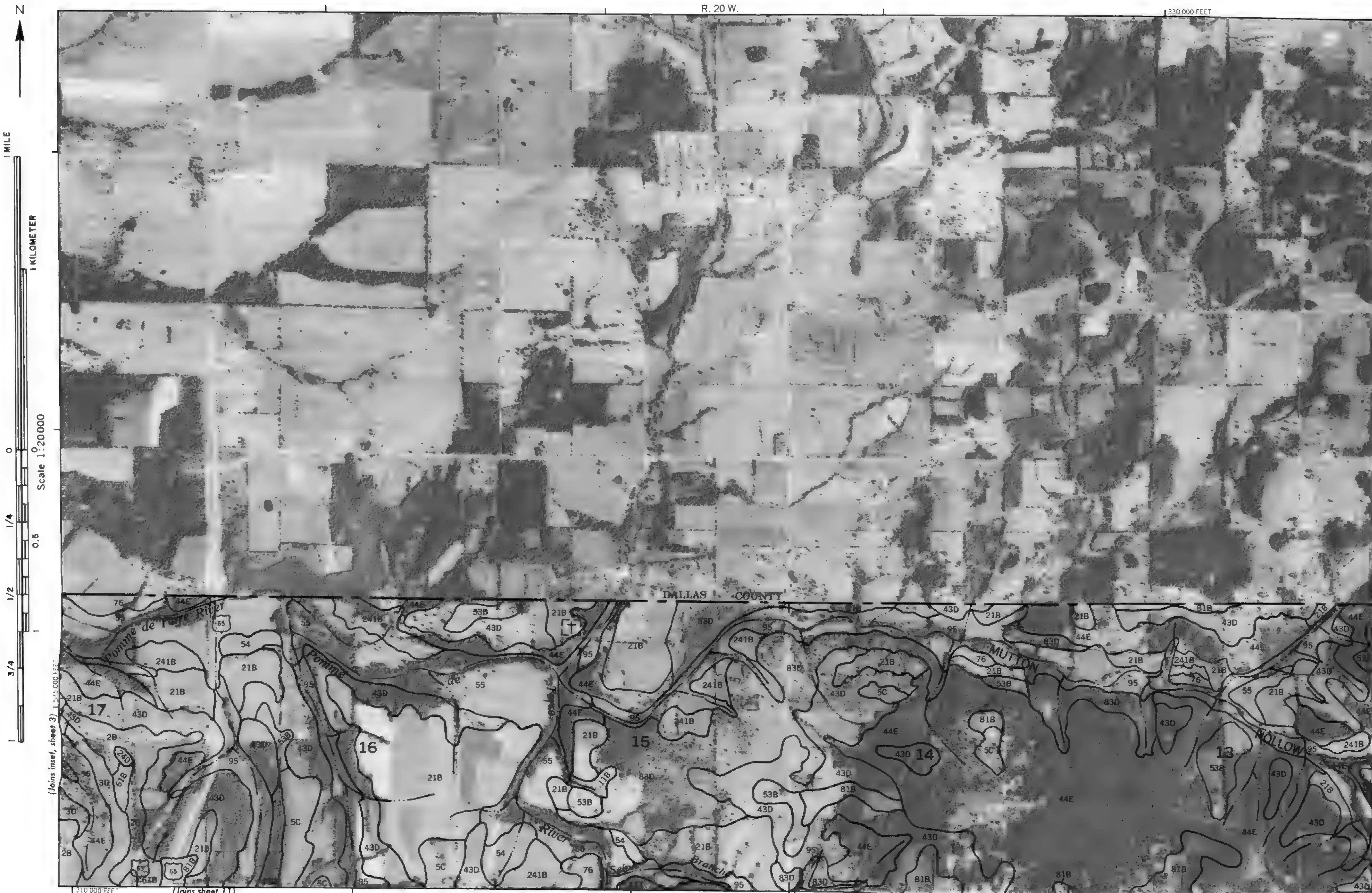
0 0.5 1

Scale 1:20000

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 3

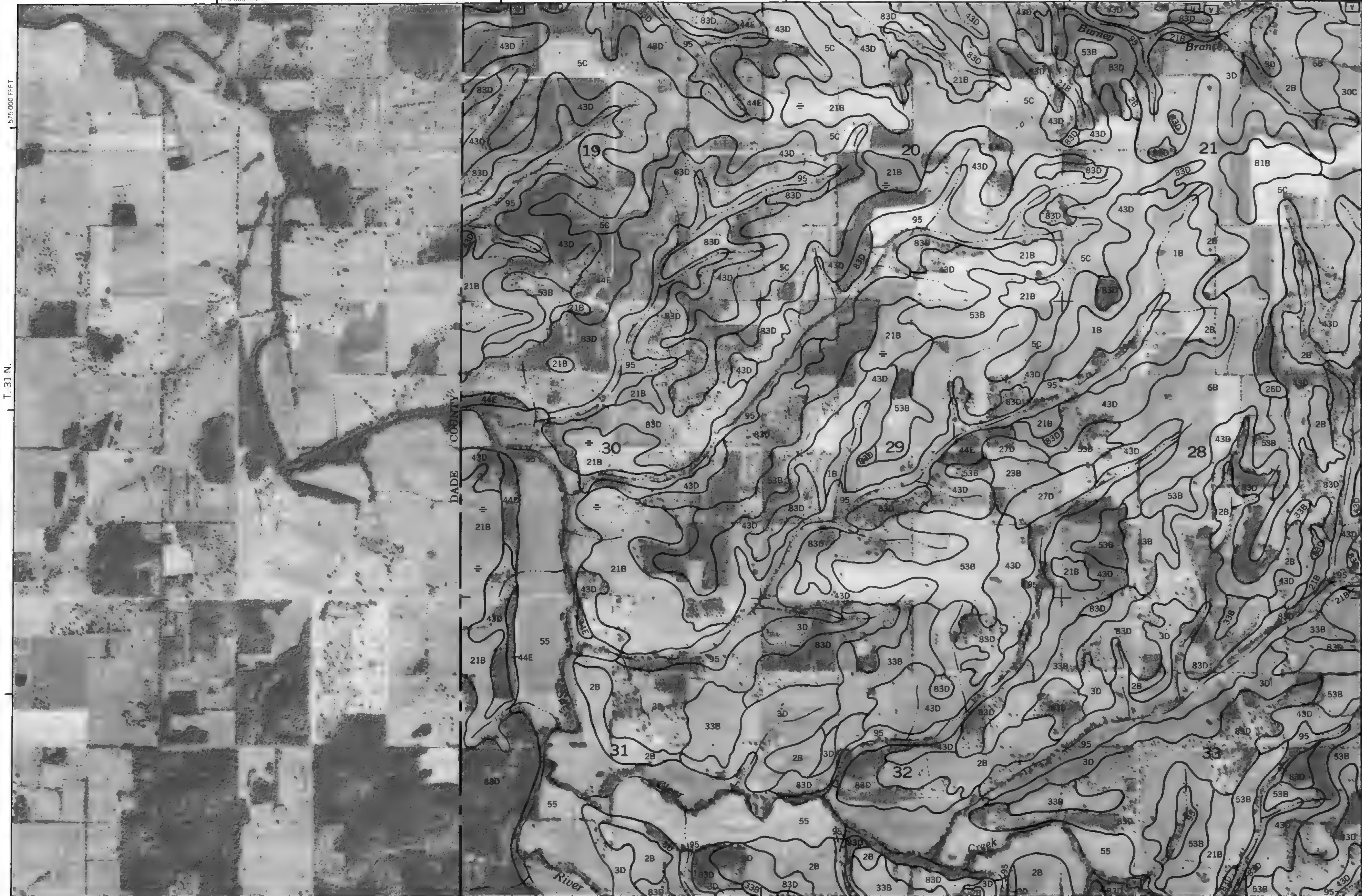
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 4



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 4



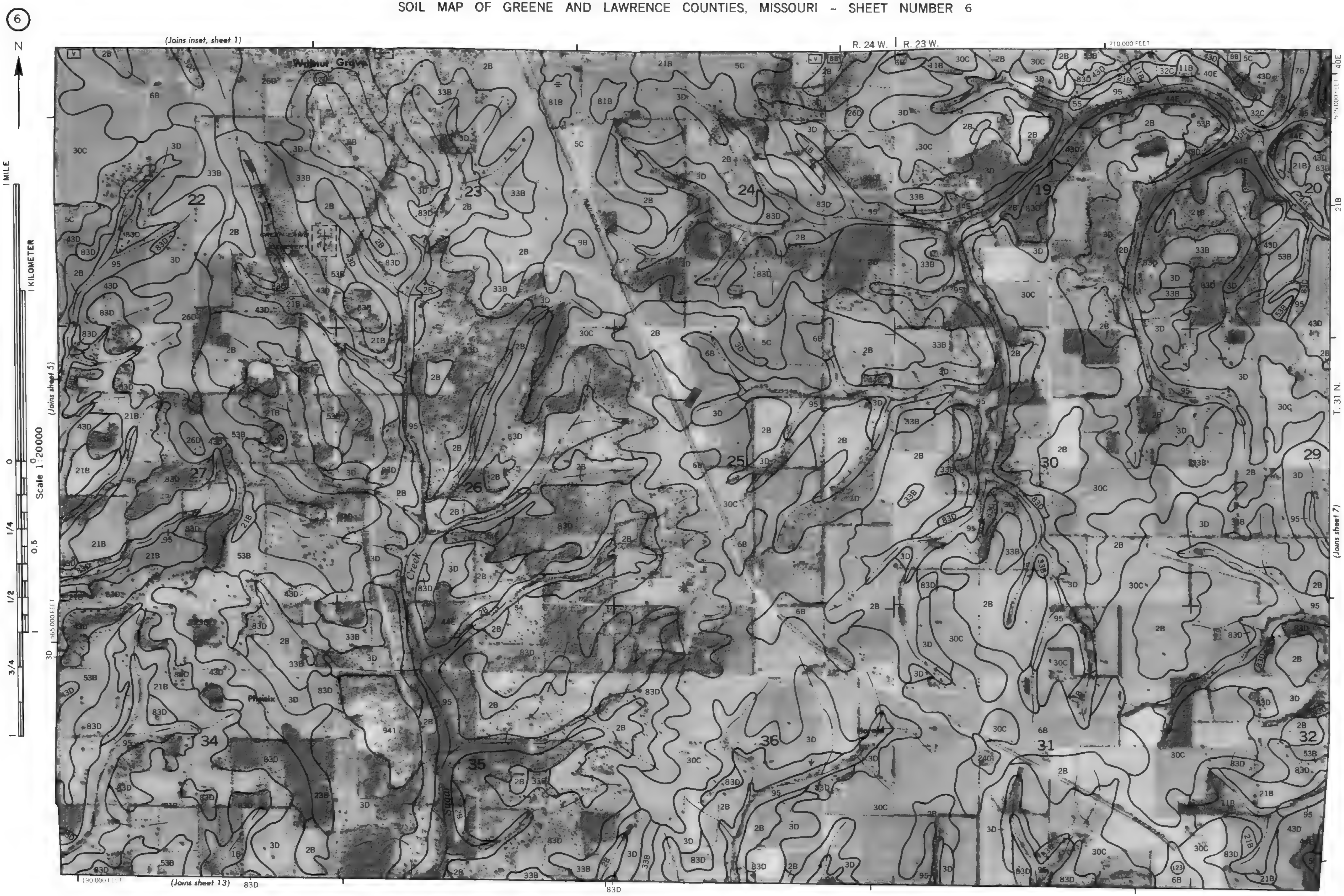
N

1 MILE
1 KILOMETER
Scale 1:20000

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 5

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

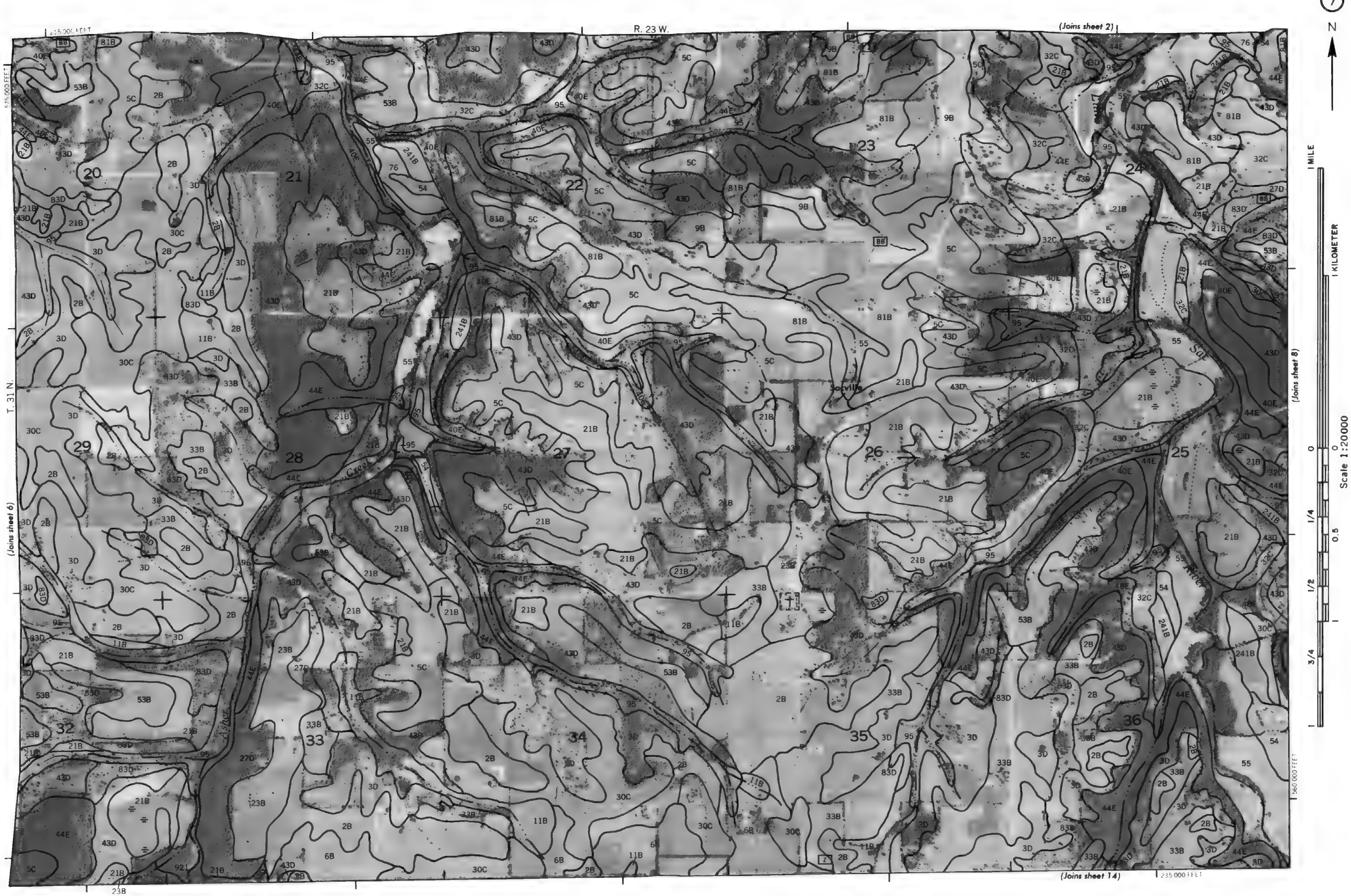
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 6



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 6

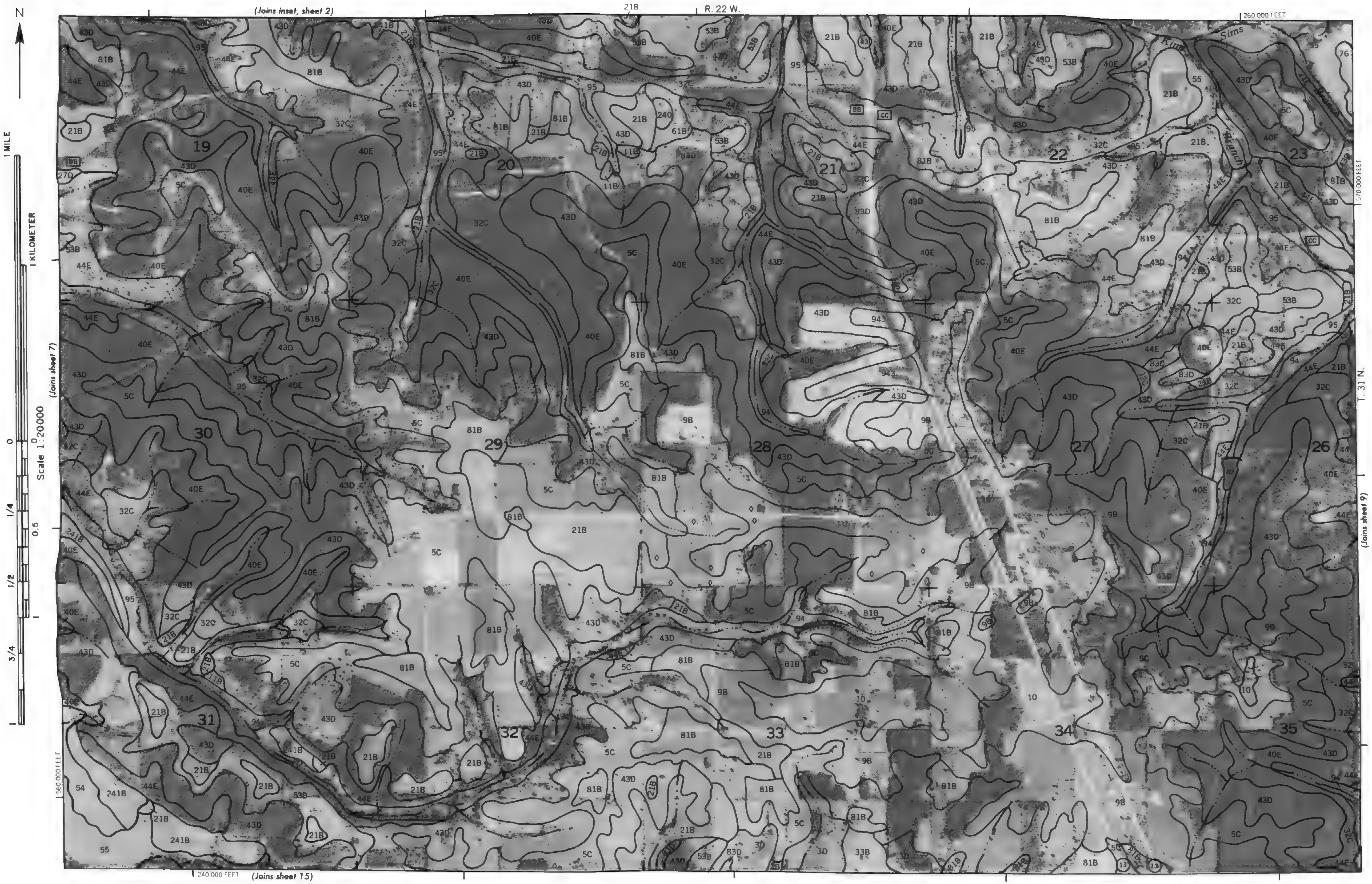
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 7



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 7

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 8



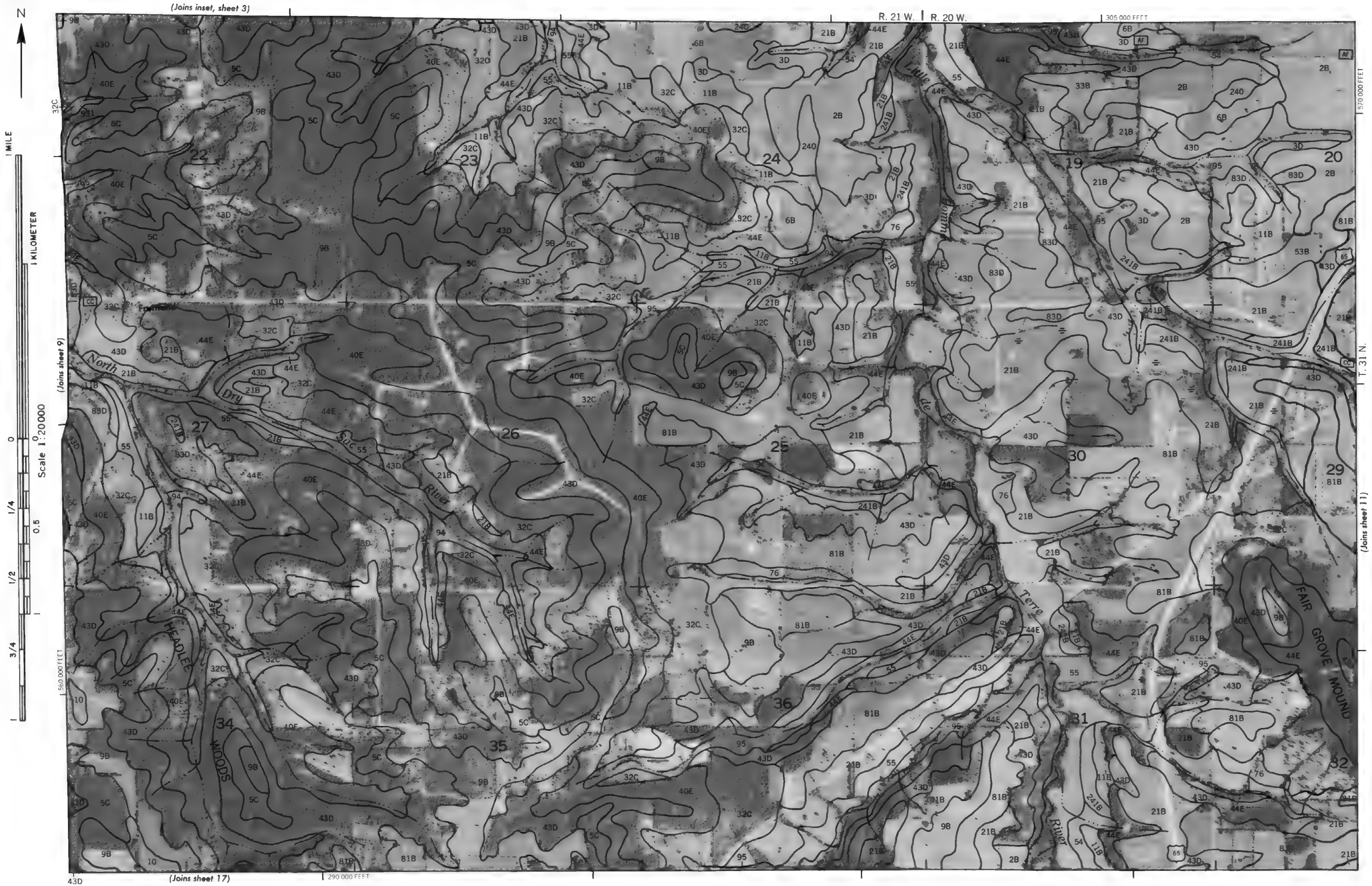
This soil survey map is compiled on 1979 aerial photographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 9

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 9

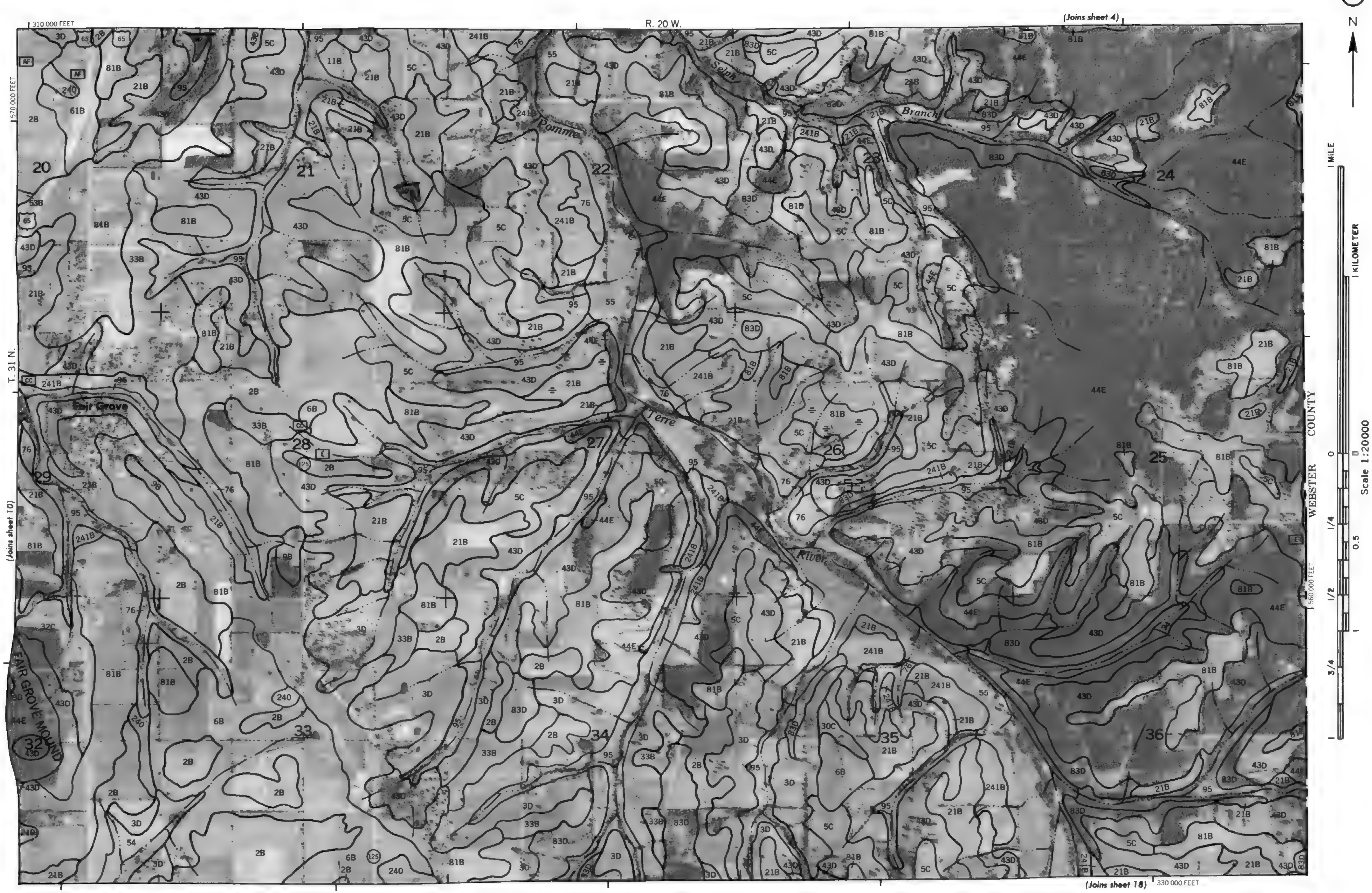
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 10



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

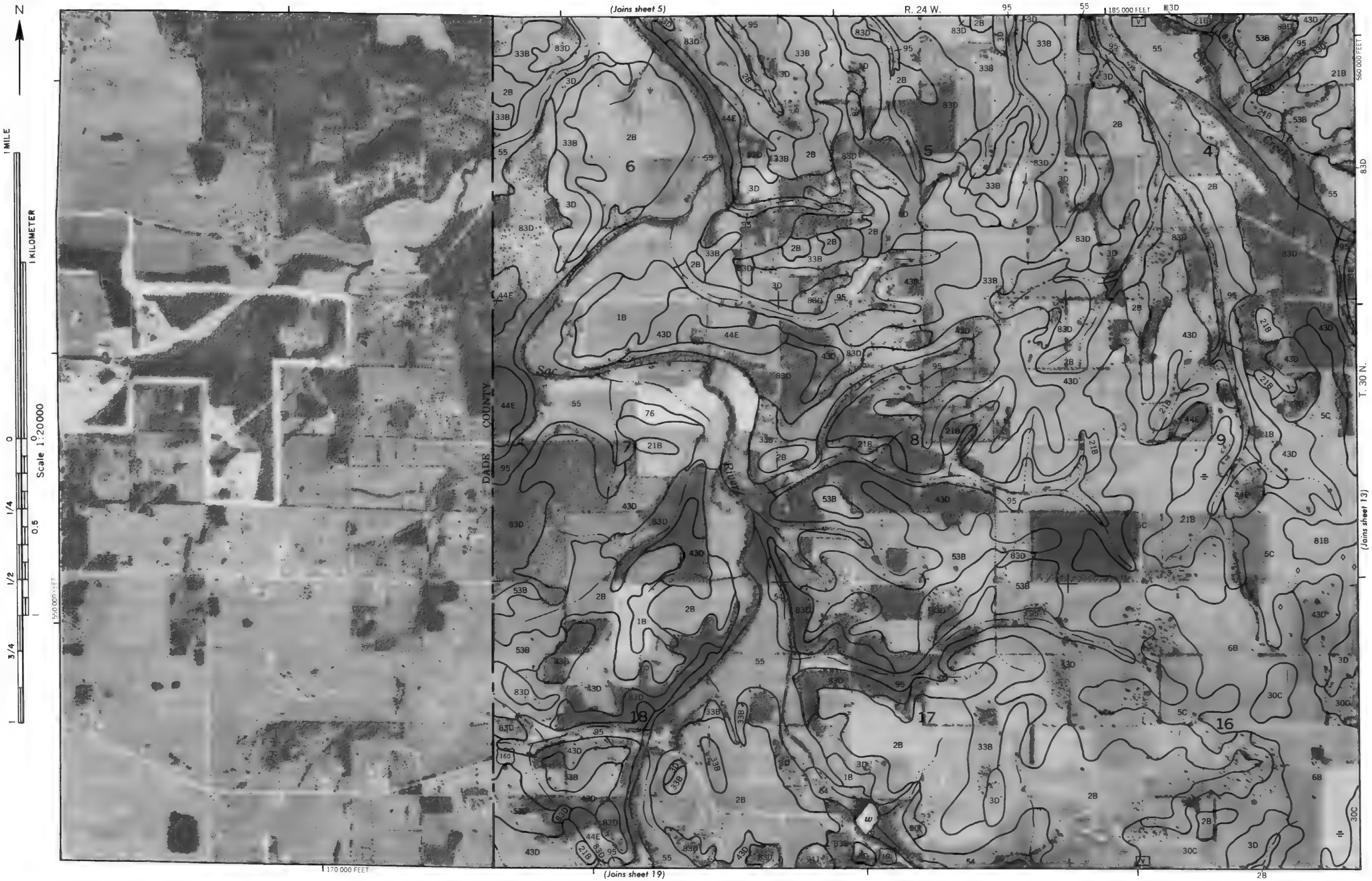
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 11



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 11

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 12

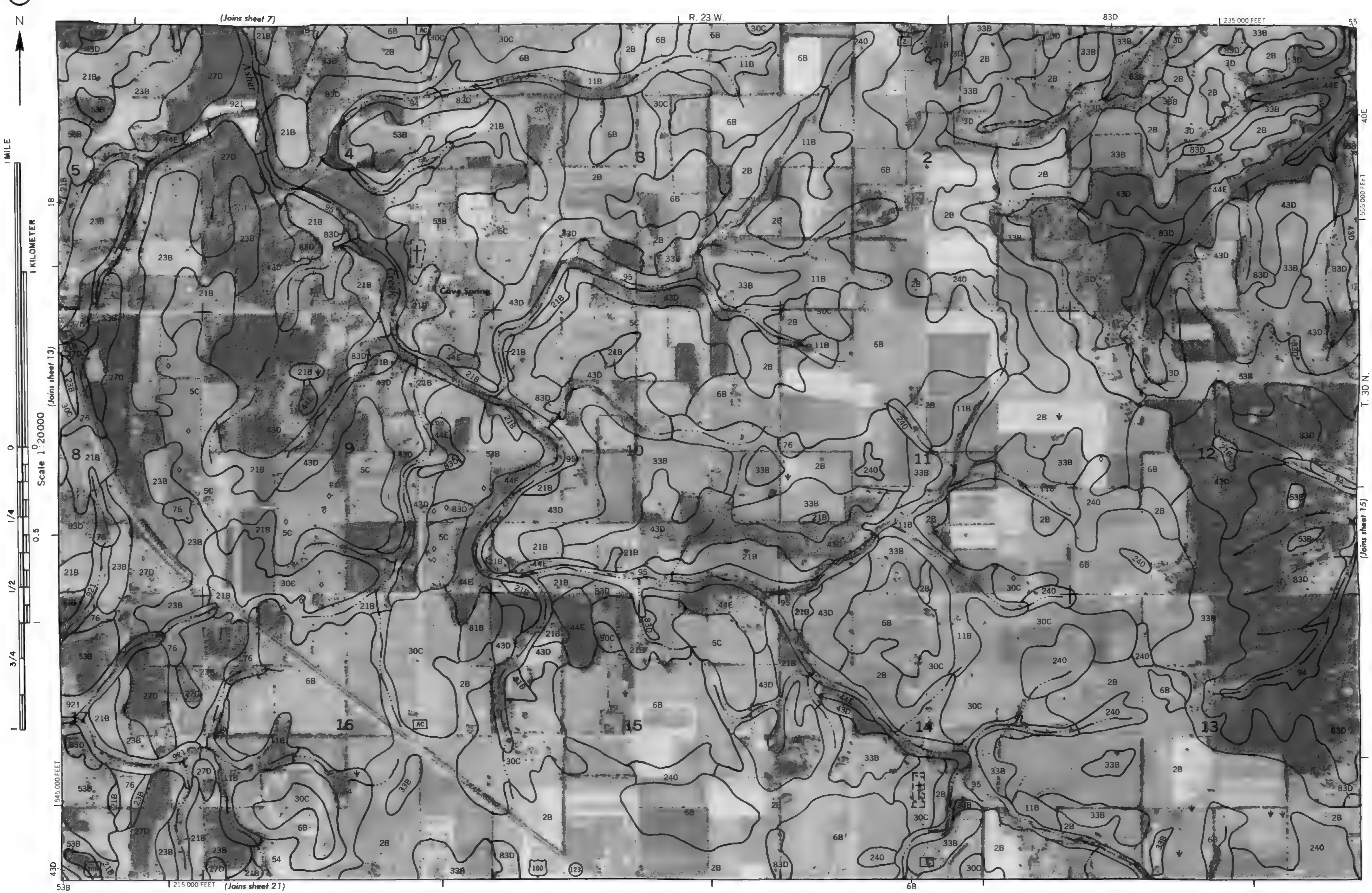


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

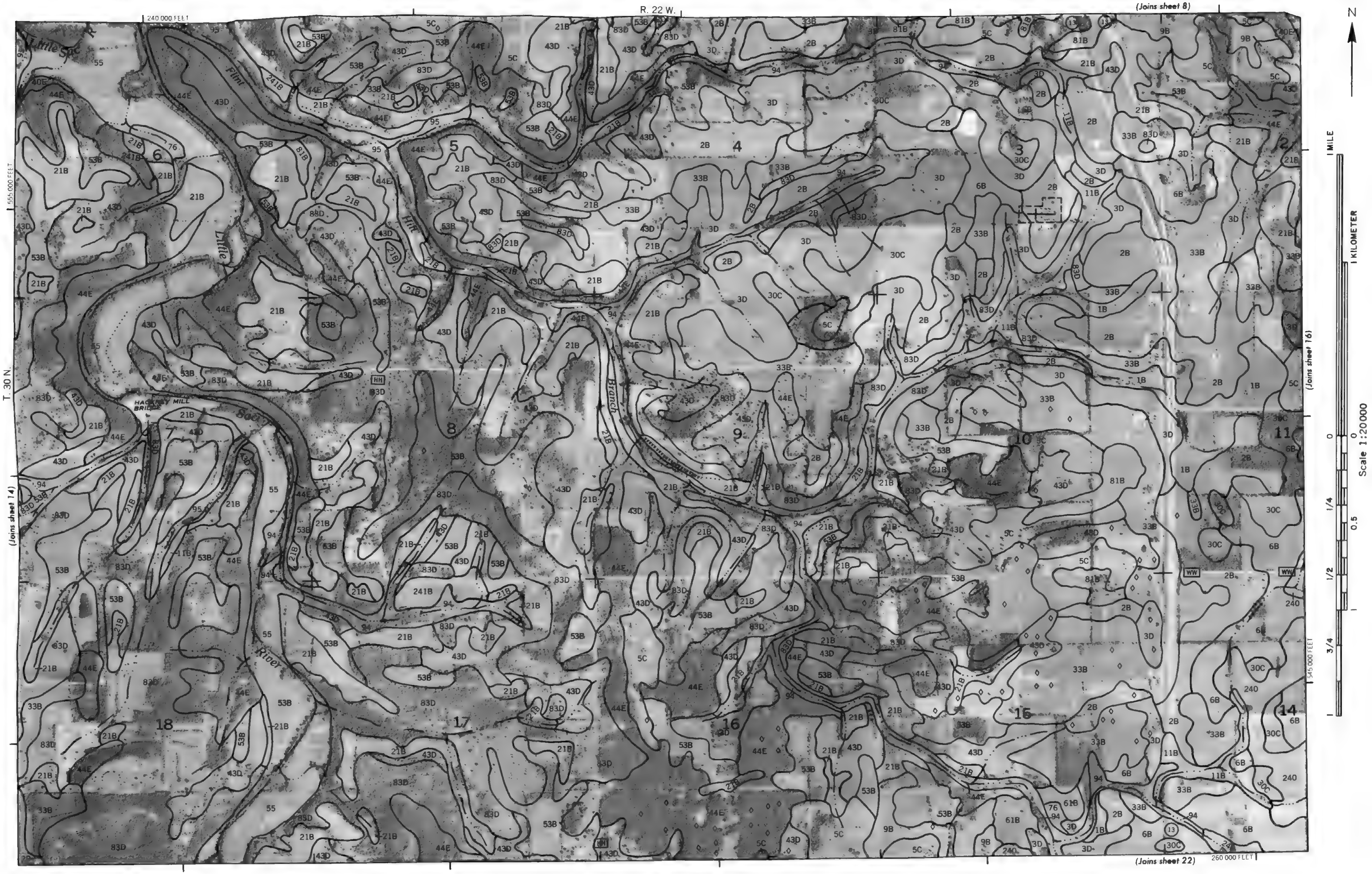
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 13

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 13

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners if shown are approximately positioned.



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 15

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(16)

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 16

N

(Joins sheet 9)

R. 22 W. | R. 21 W.

(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 23)

1 MILE

1 KILOMETER

Scale 1:20000

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 16

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 17

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 17

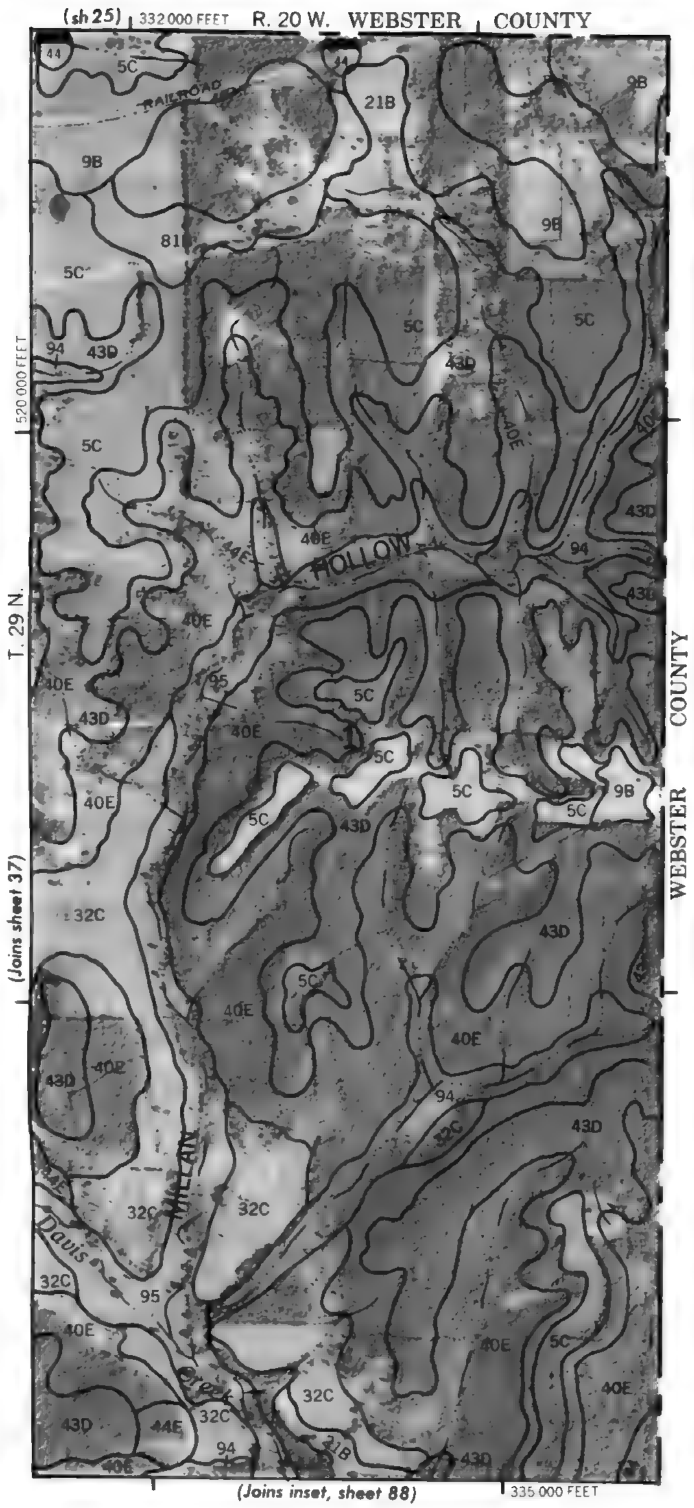
This soil survey map is compiled on 1979 aerial photography by the U S Department of Agriculture Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 18

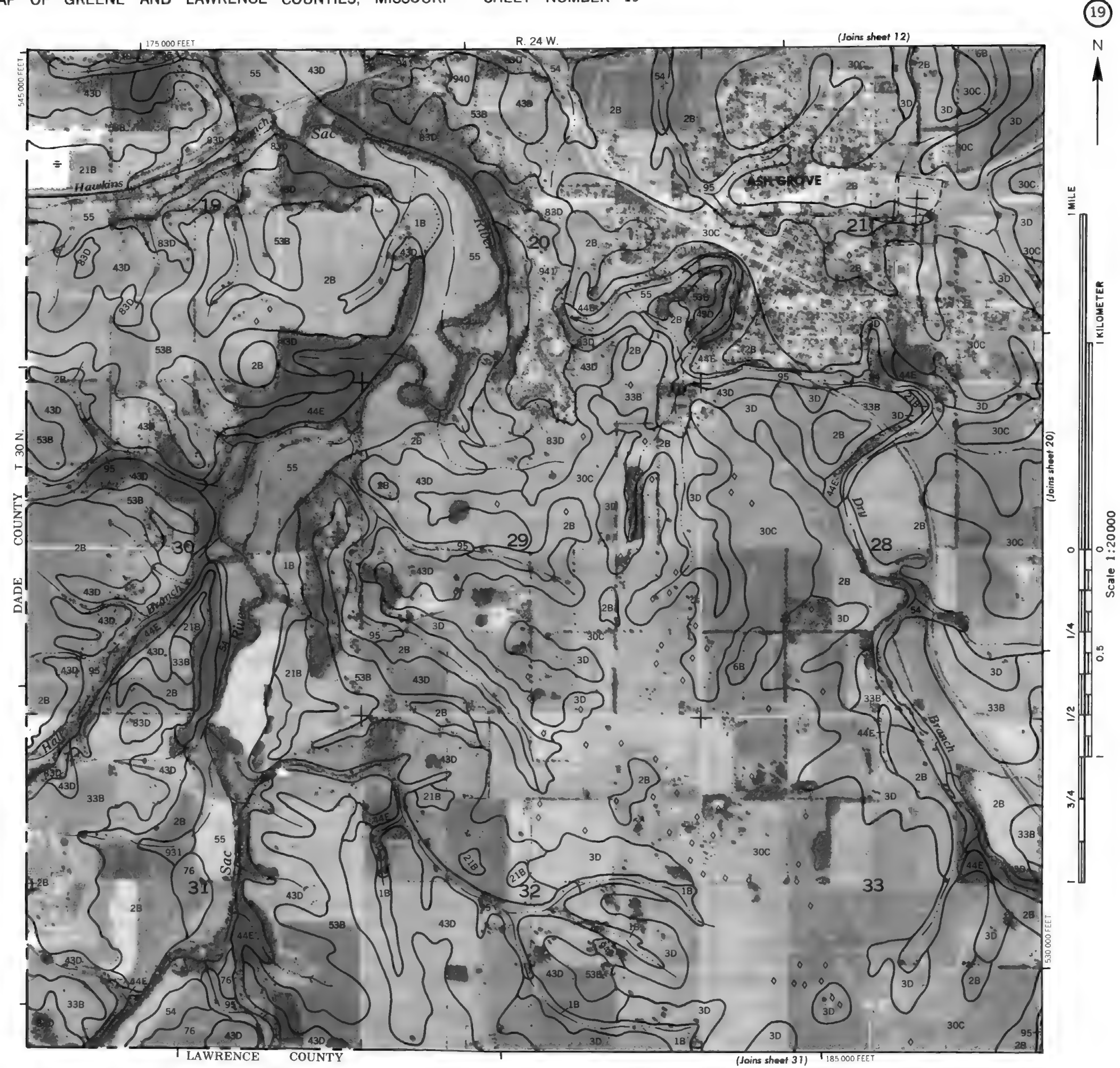
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 19

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



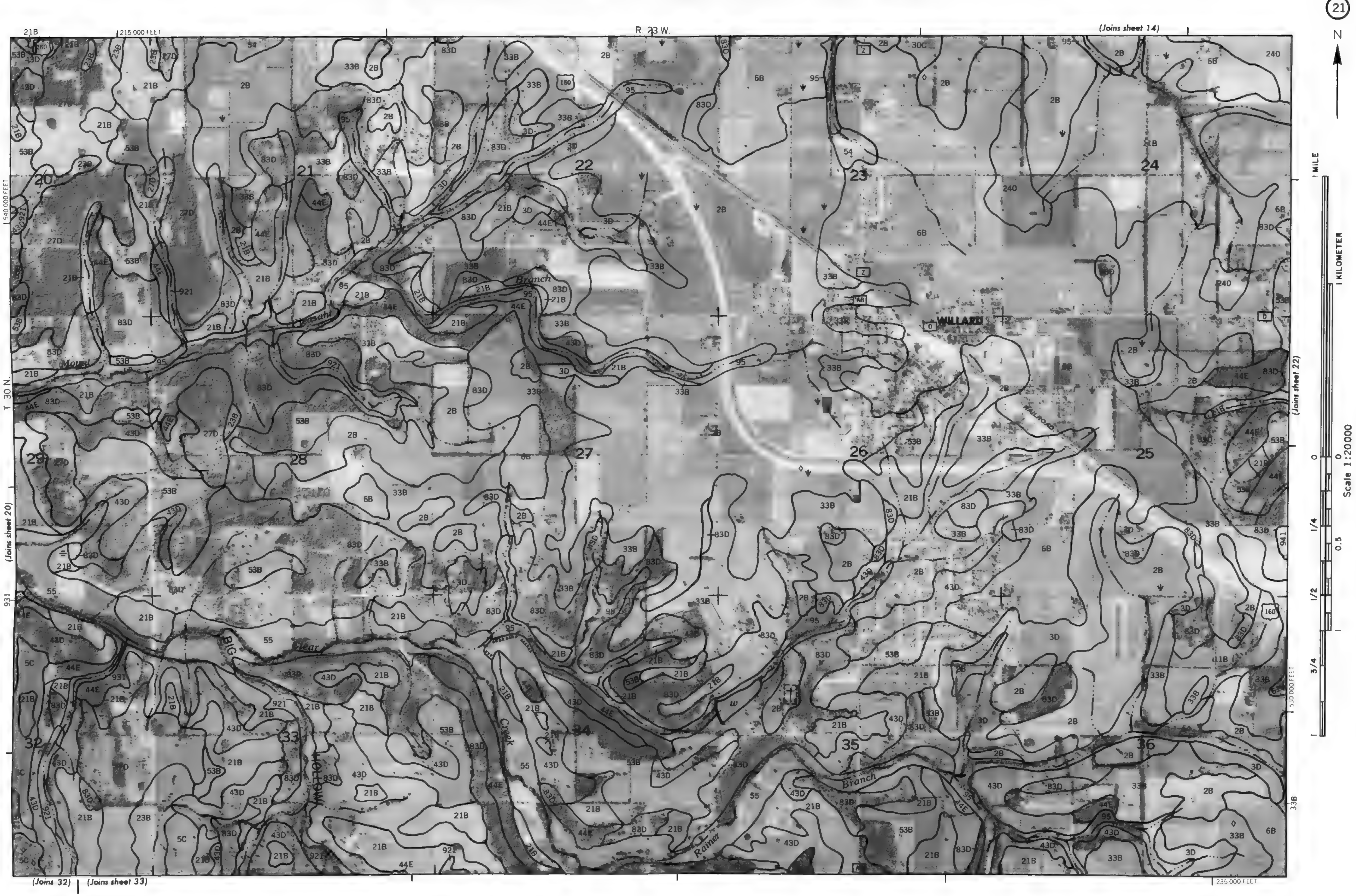
3000 AND 5000-FOOT GRID TICKS



SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 20

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 21



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 21

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 22

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners if shown are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 23

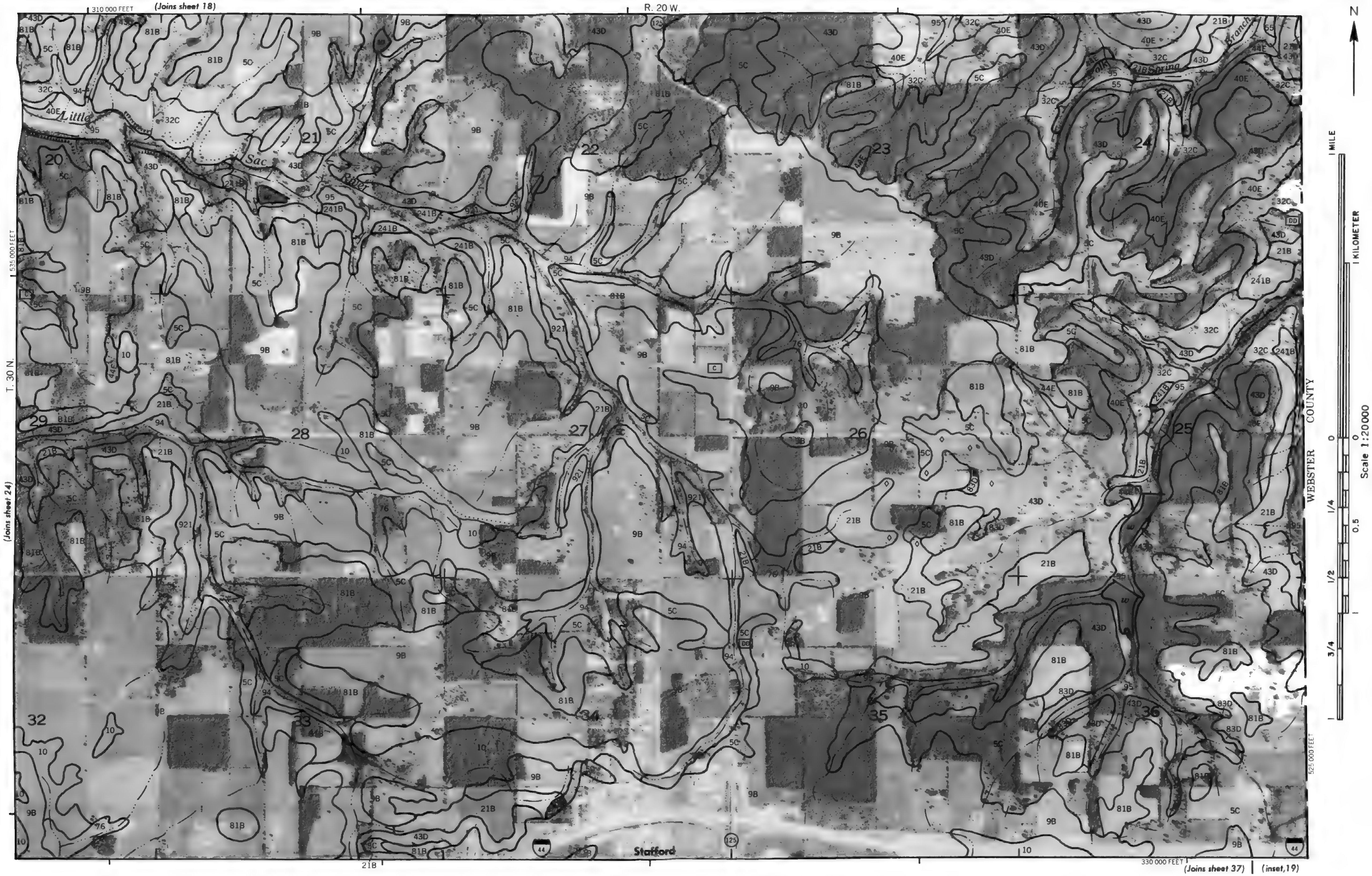
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 23

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 24

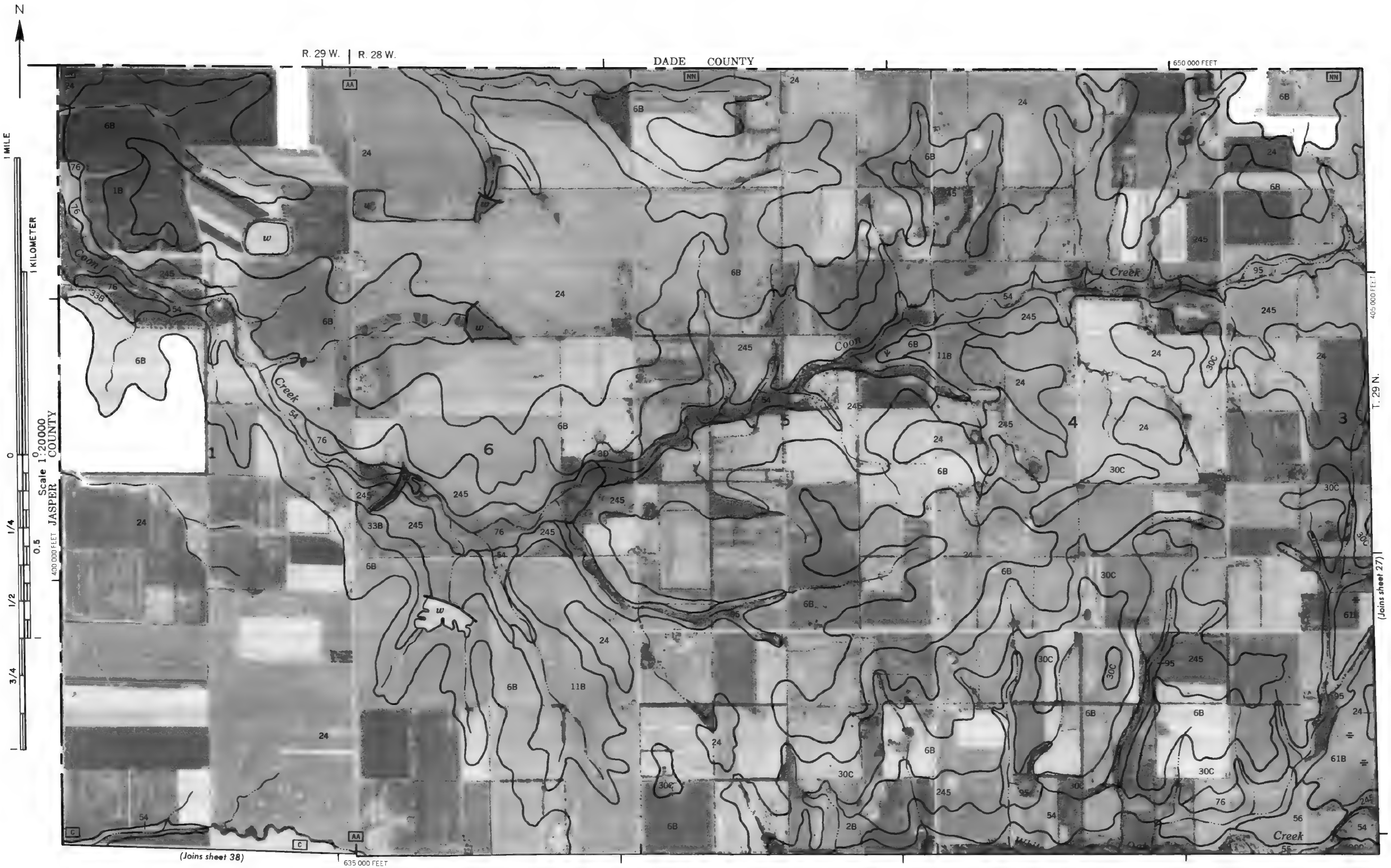
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 24



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

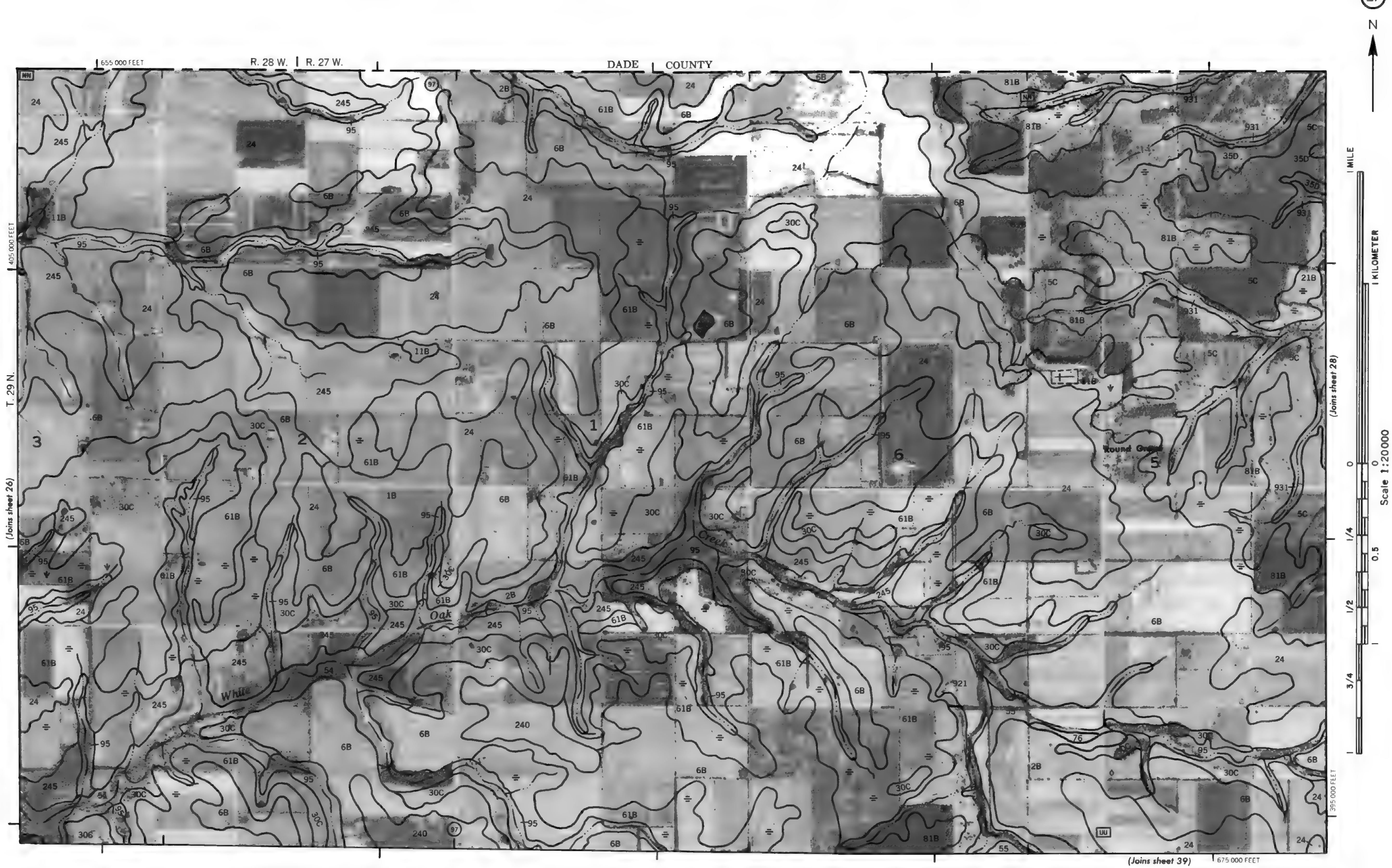
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 26



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 26

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 27



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 27

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(28)

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 28

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 28

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 29

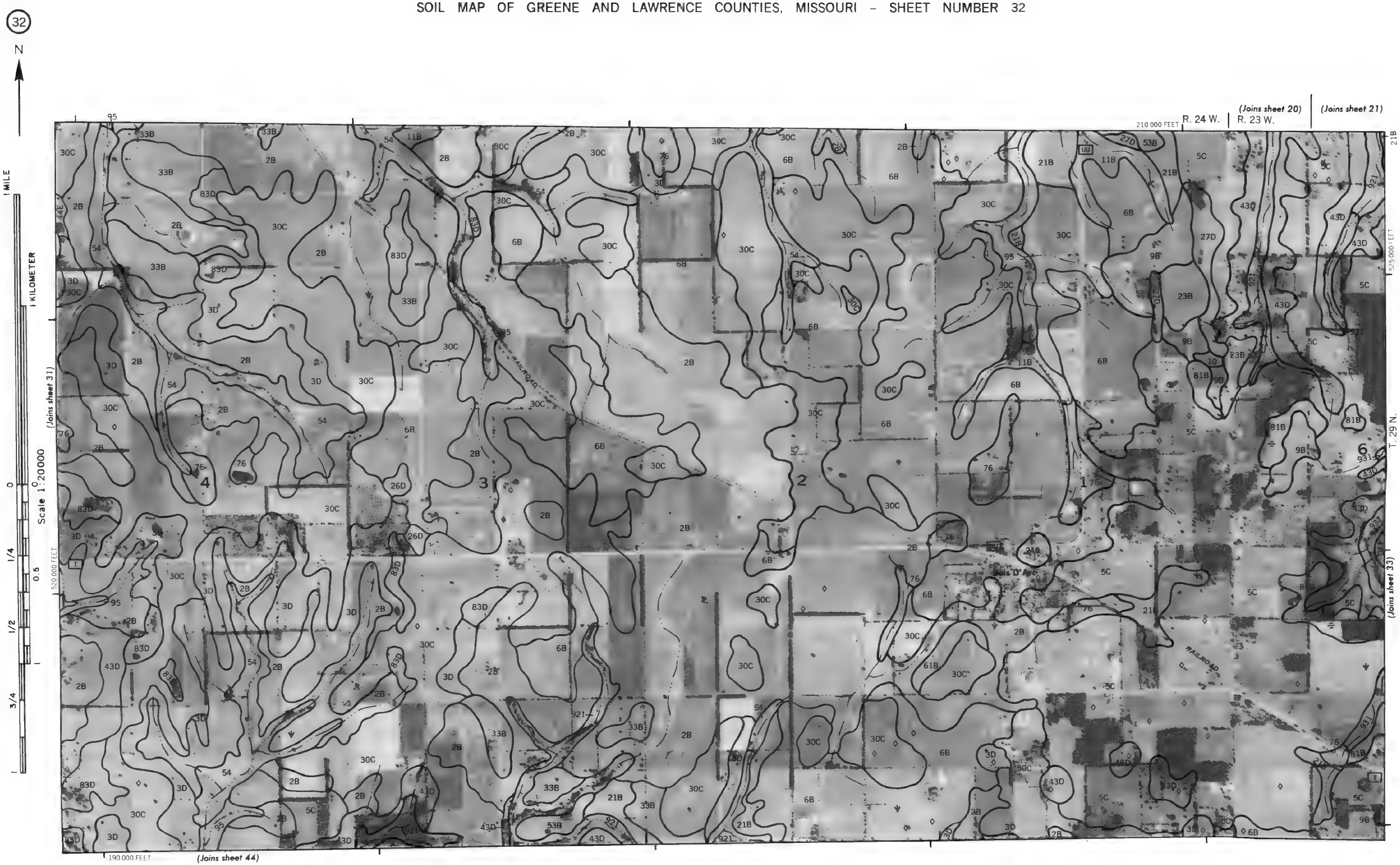
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 30

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 30

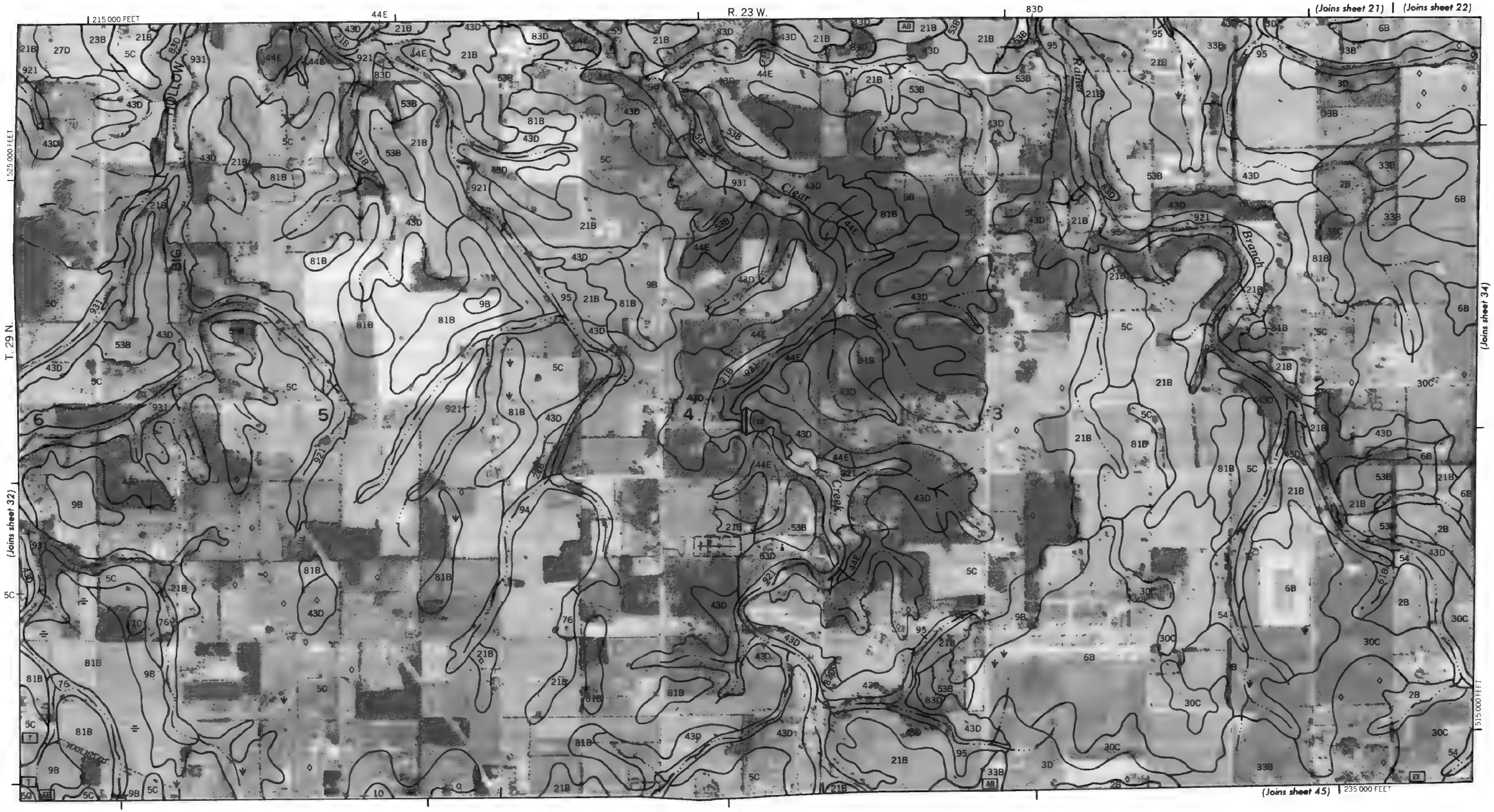
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

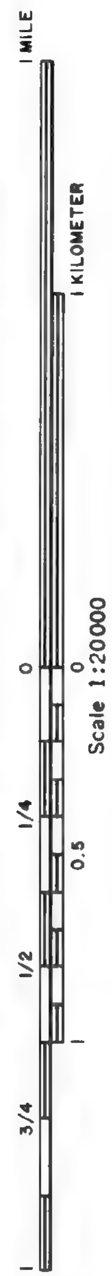


This soil survey map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 32

N

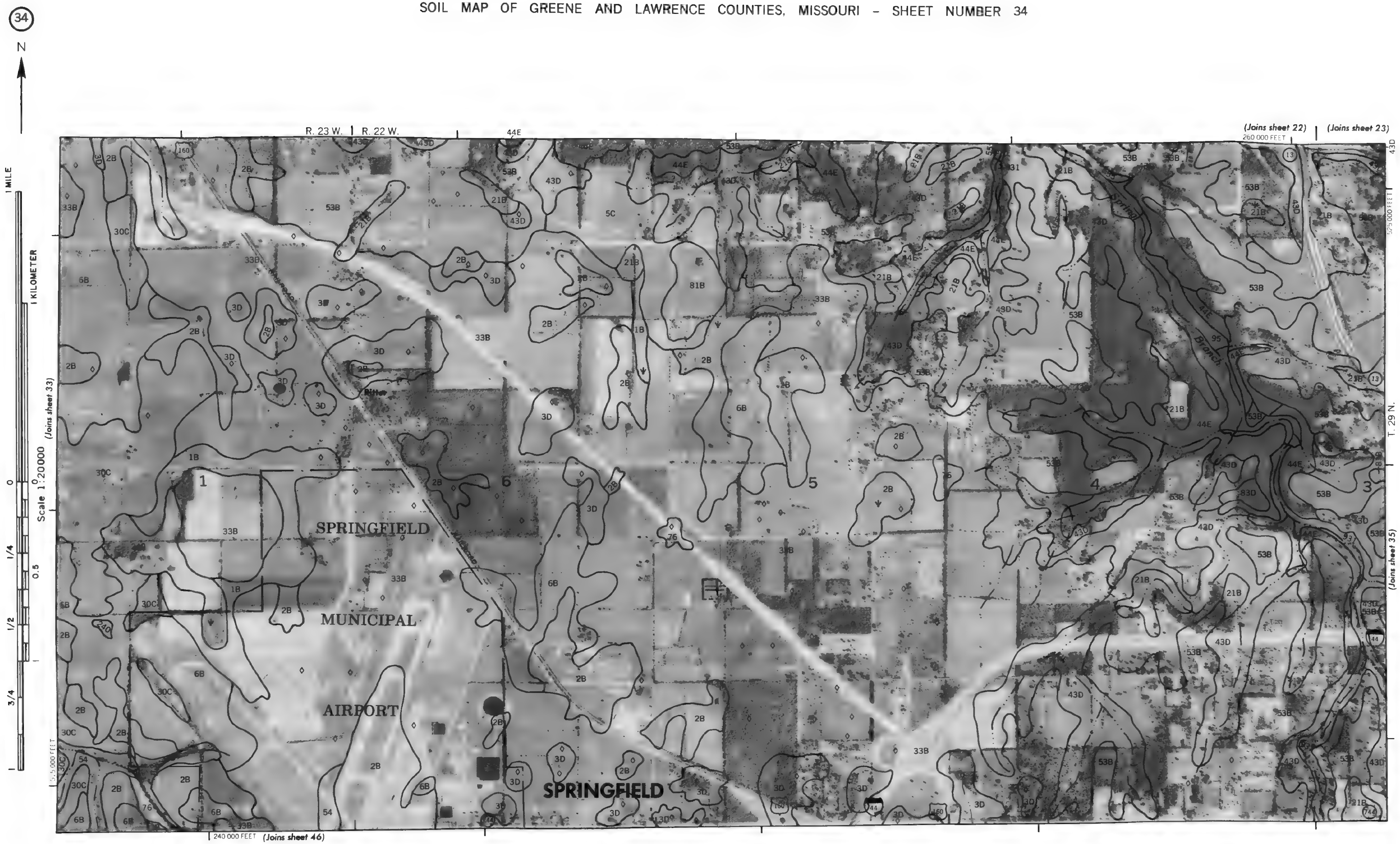




GREENE & LAWRENCE COUNTIES, MISSOURI NO. 33

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners if shown are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 34

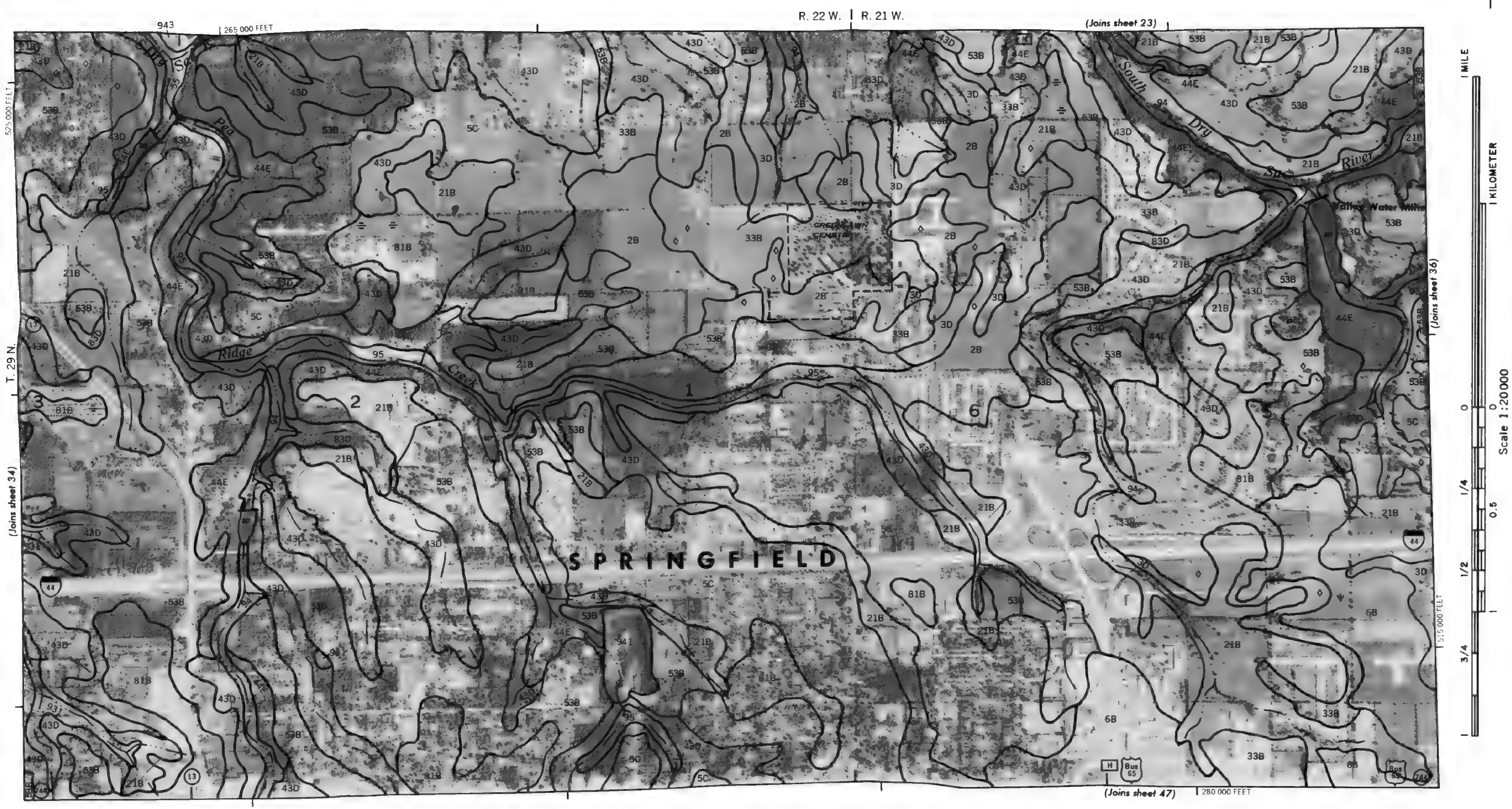


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 34

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 35

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 36

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 37

(37)

N

1 MILE
1 KILOMETER
Scale 1:20000

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 37

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

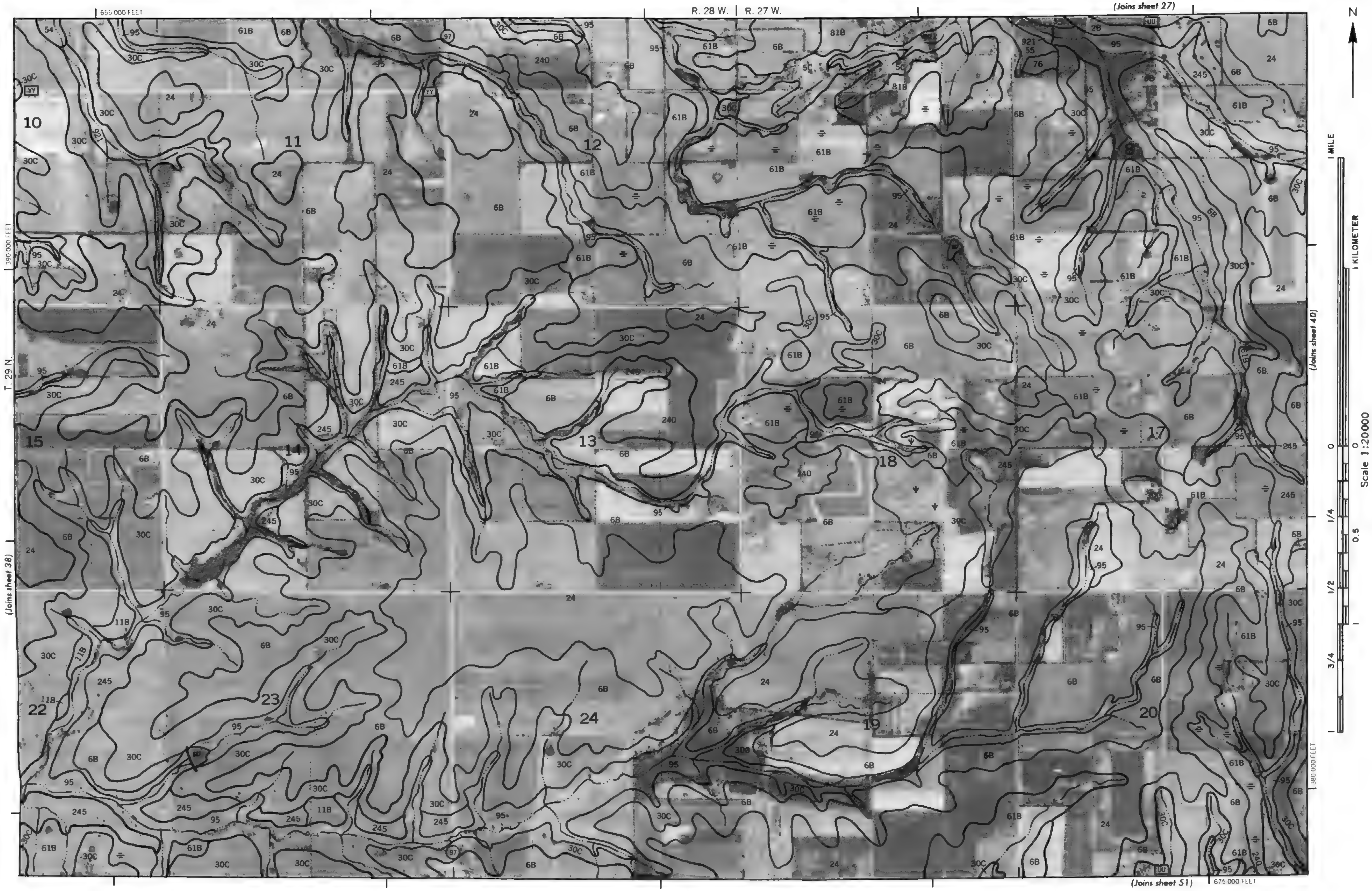
38

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 38

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 38

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 39



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 39

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

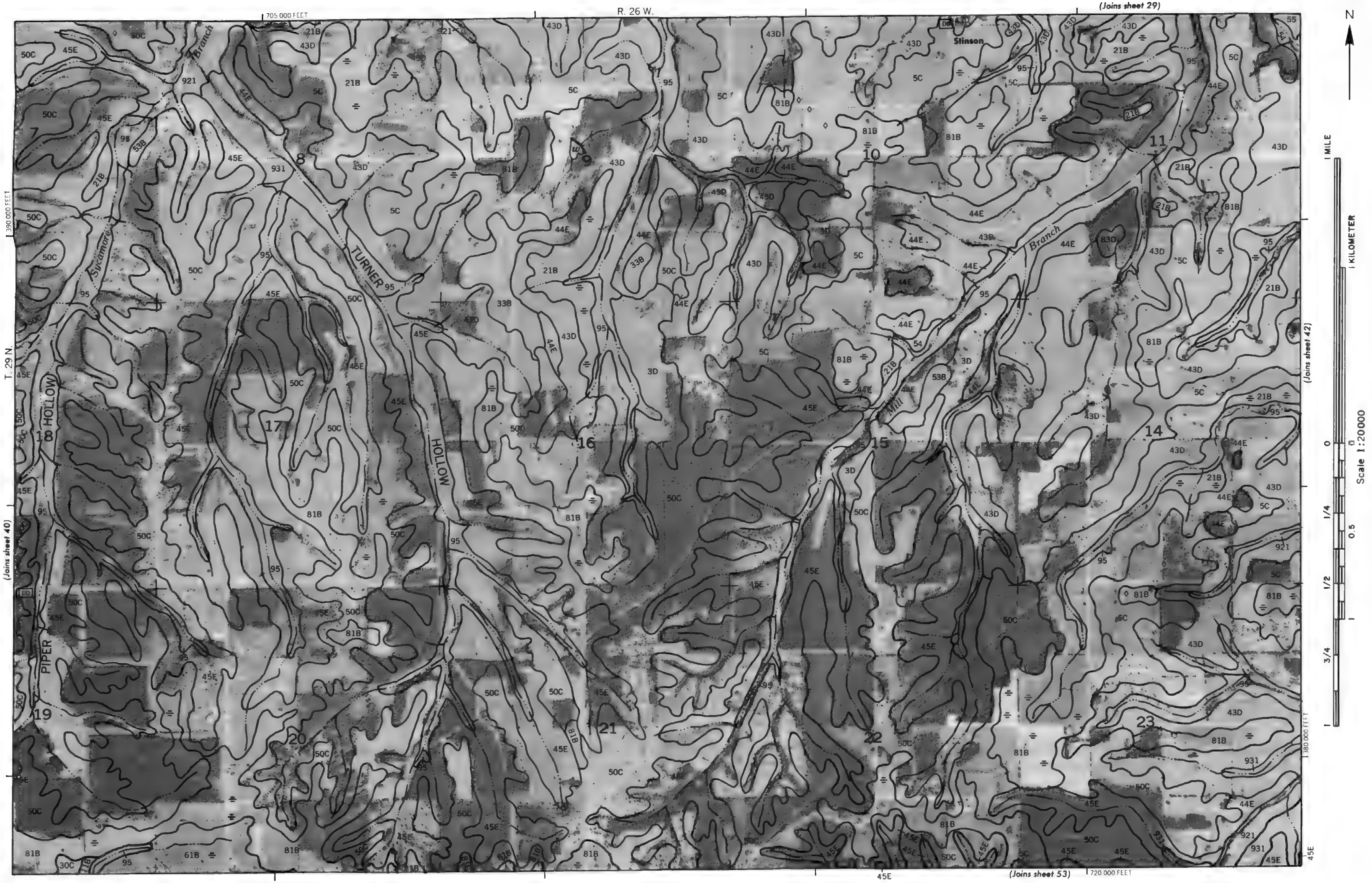
40

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 40

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 40

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 41



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 41

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 42

N

1 MILE

1 KILOMETER

Scale 1:20000

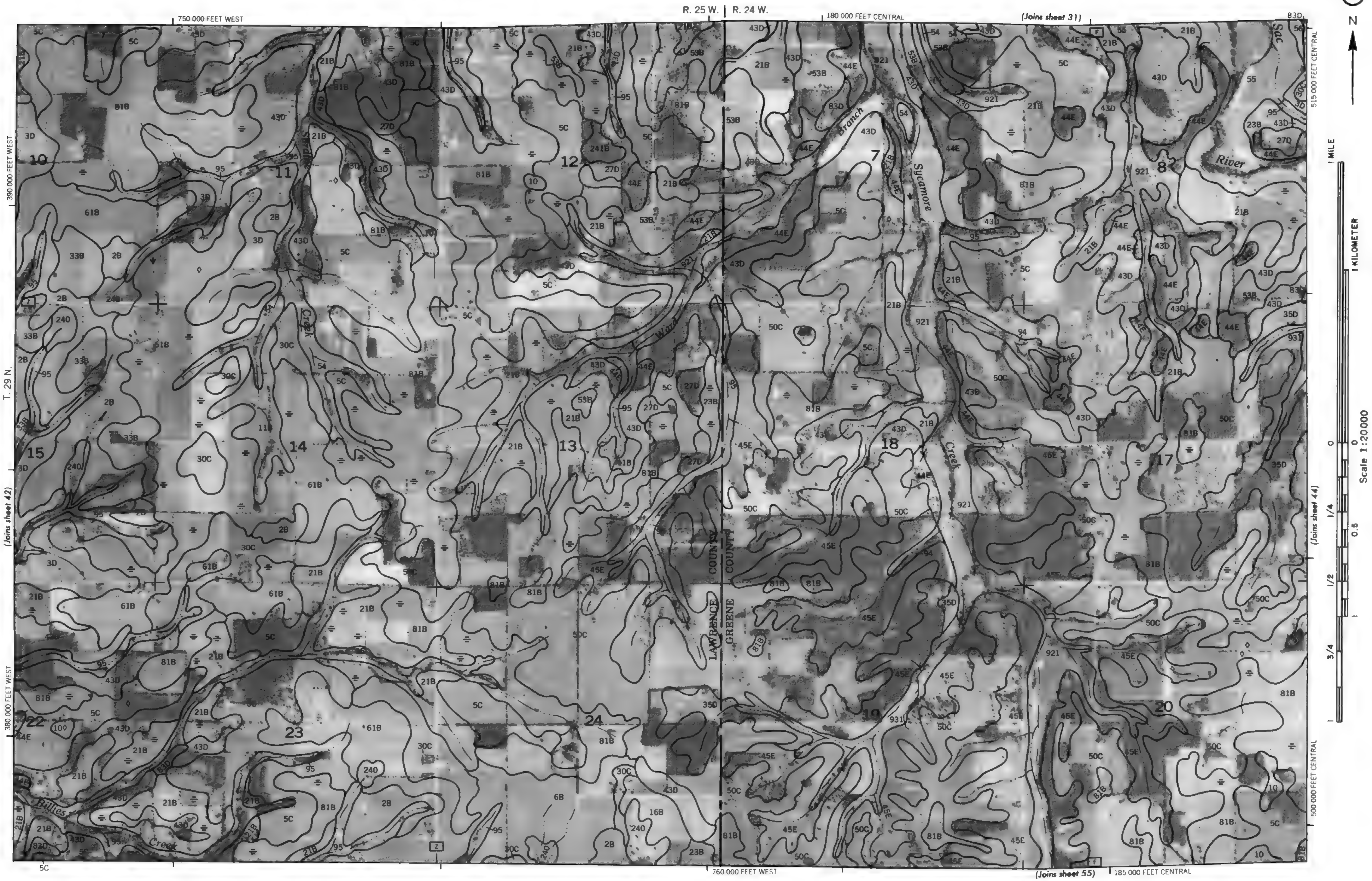
0 — 1/4 — 1/2 — 3/4 — 1

0 — 0.5 — 1

This soil survey map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 43

43



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 43

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners are approximately positioned.

44

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 44

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 44

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 45

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 45

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 46

N

1 MILE

1 KILOMETER

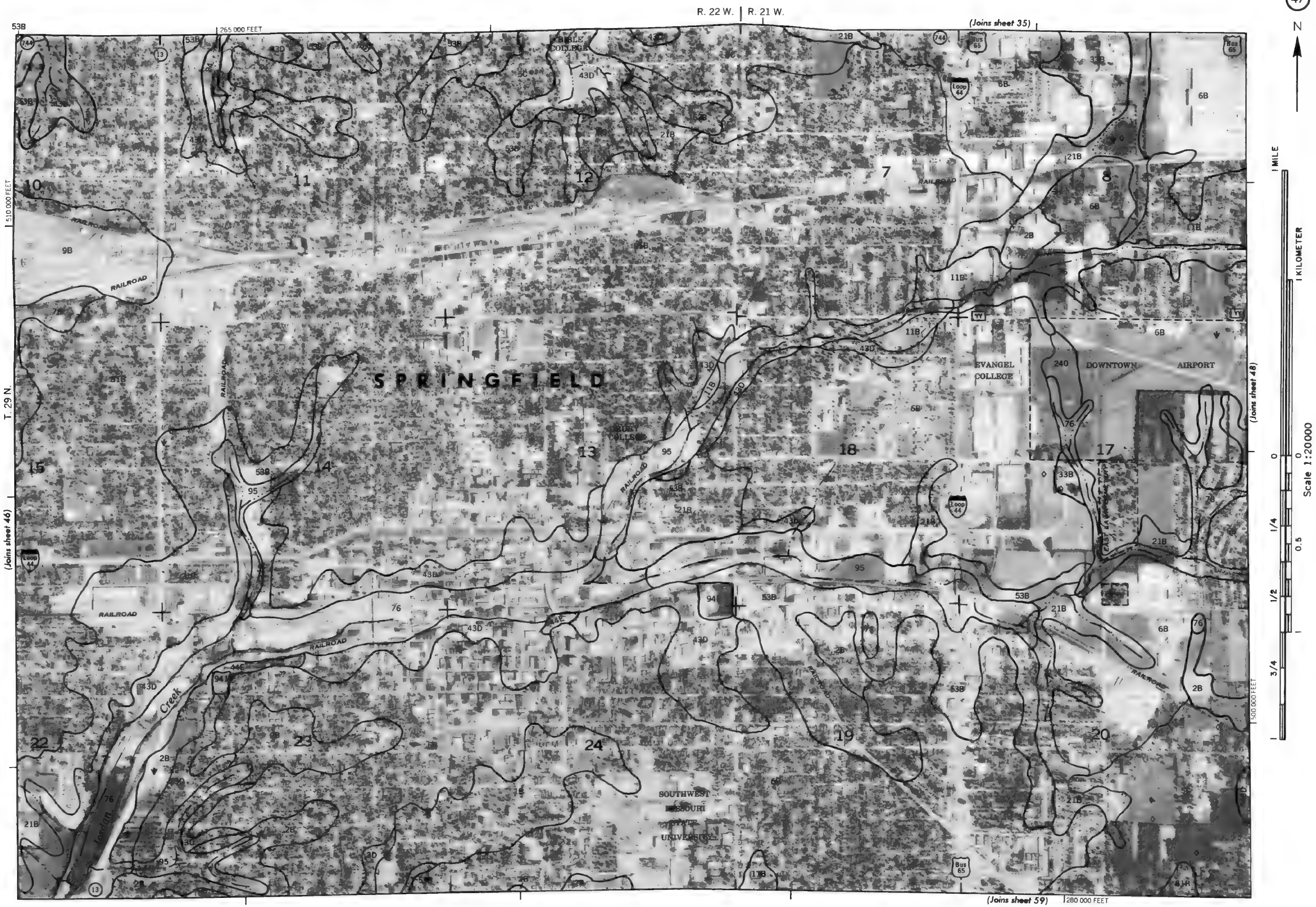
Scale 1:20000

0 1/4 1/2 3/4 1

0 0.5 1

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 47



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 47

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

48

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 48

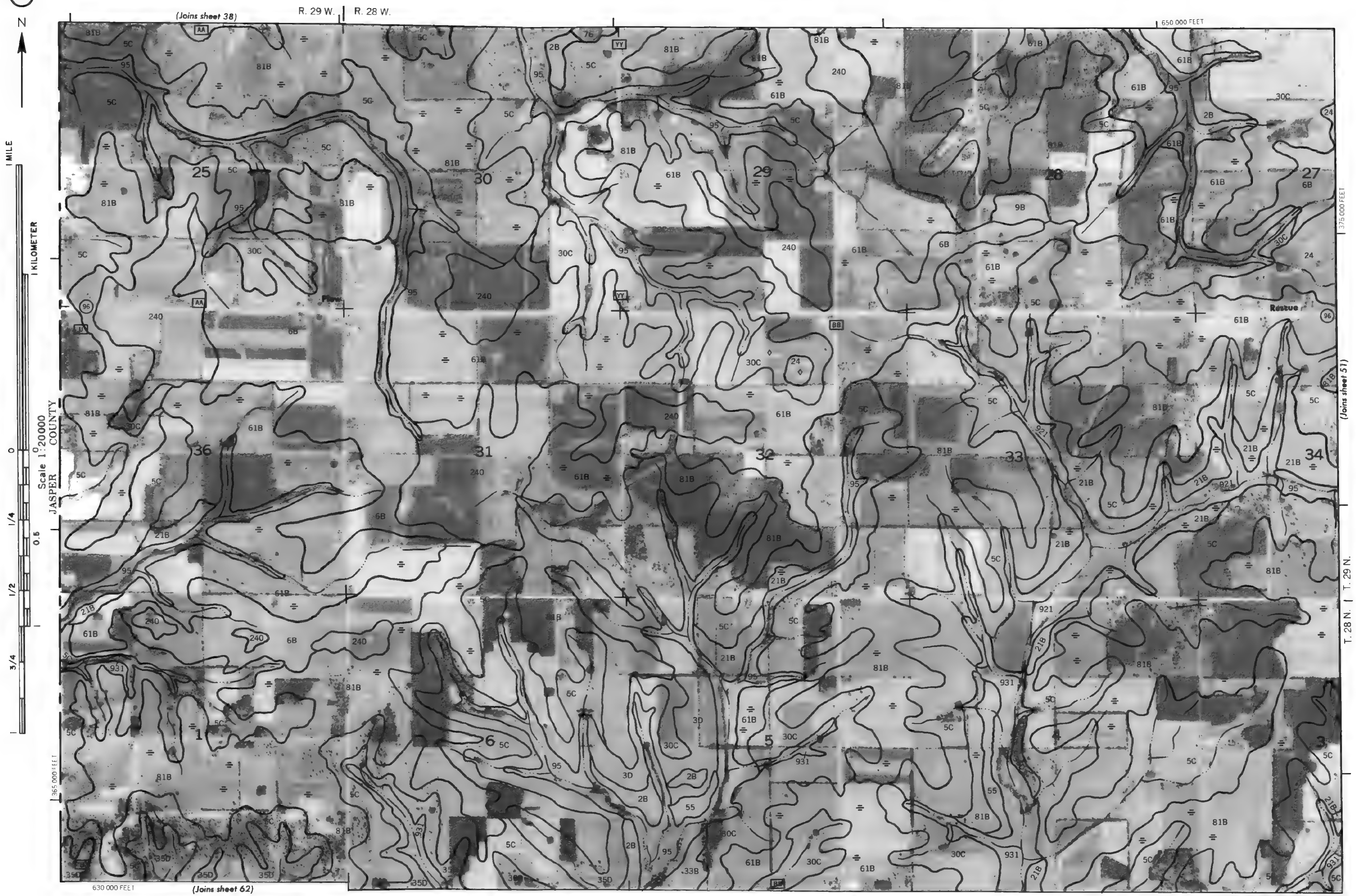
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 48

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 49

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

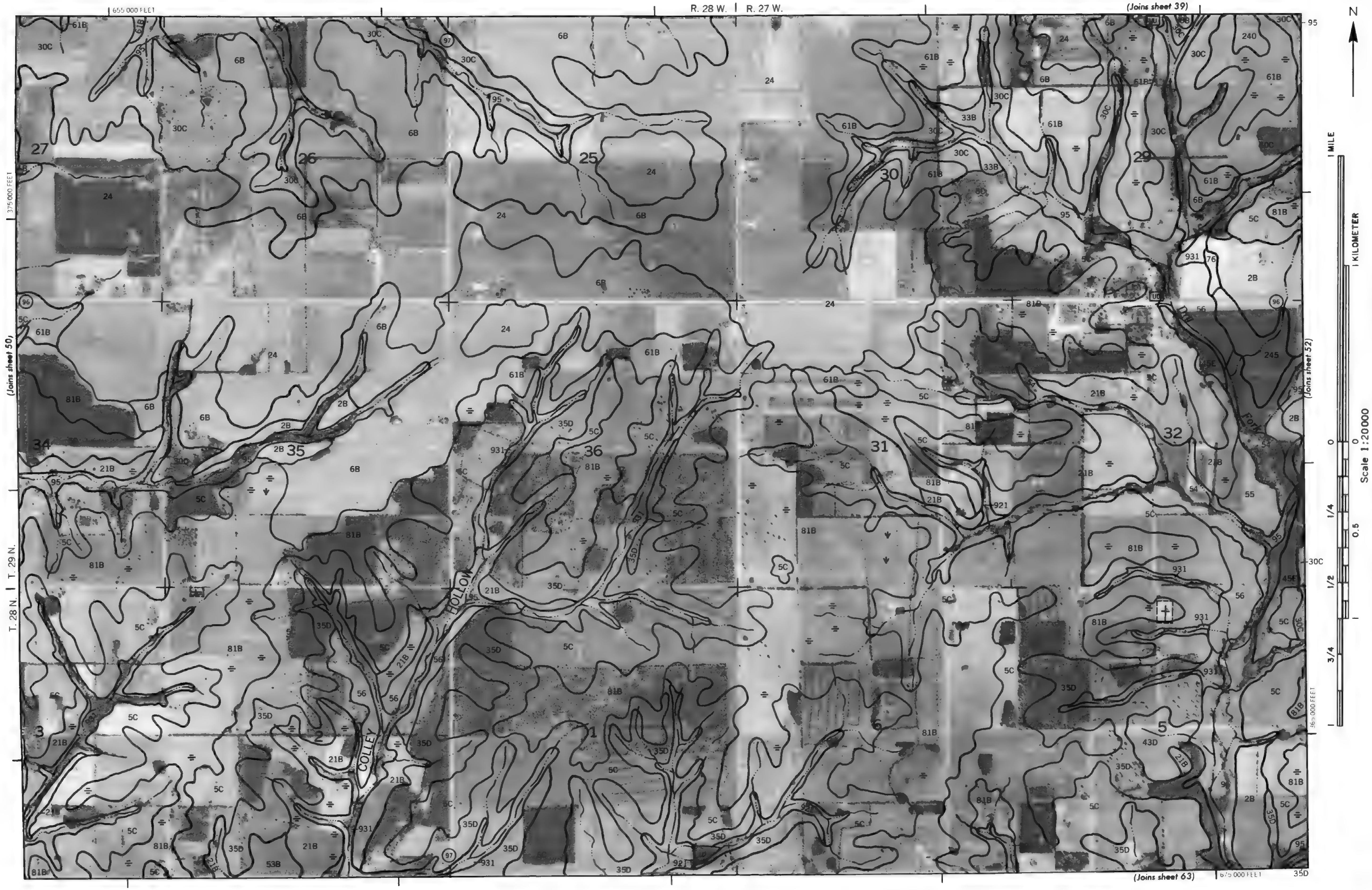
50



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 51

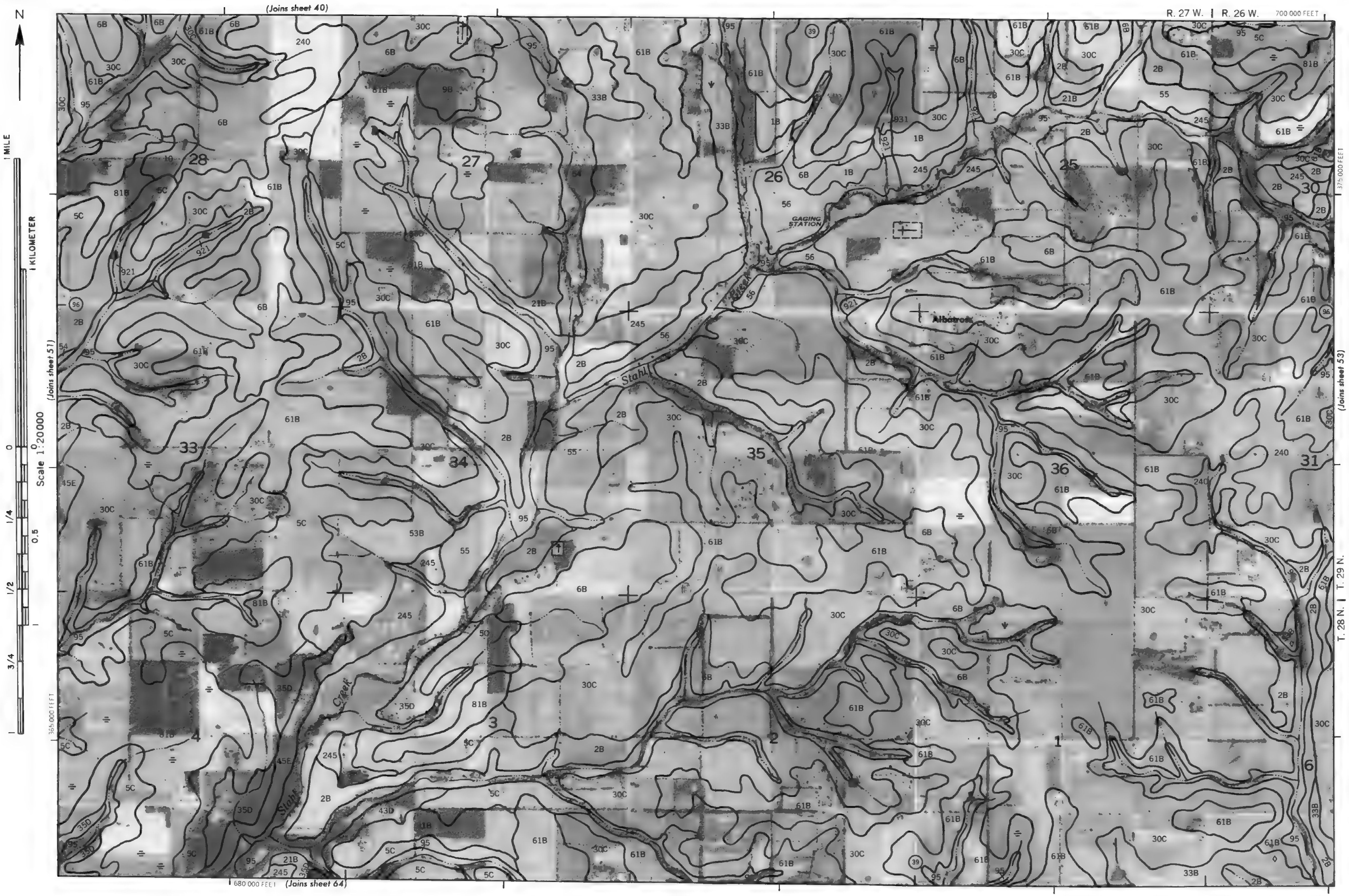
51



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 51

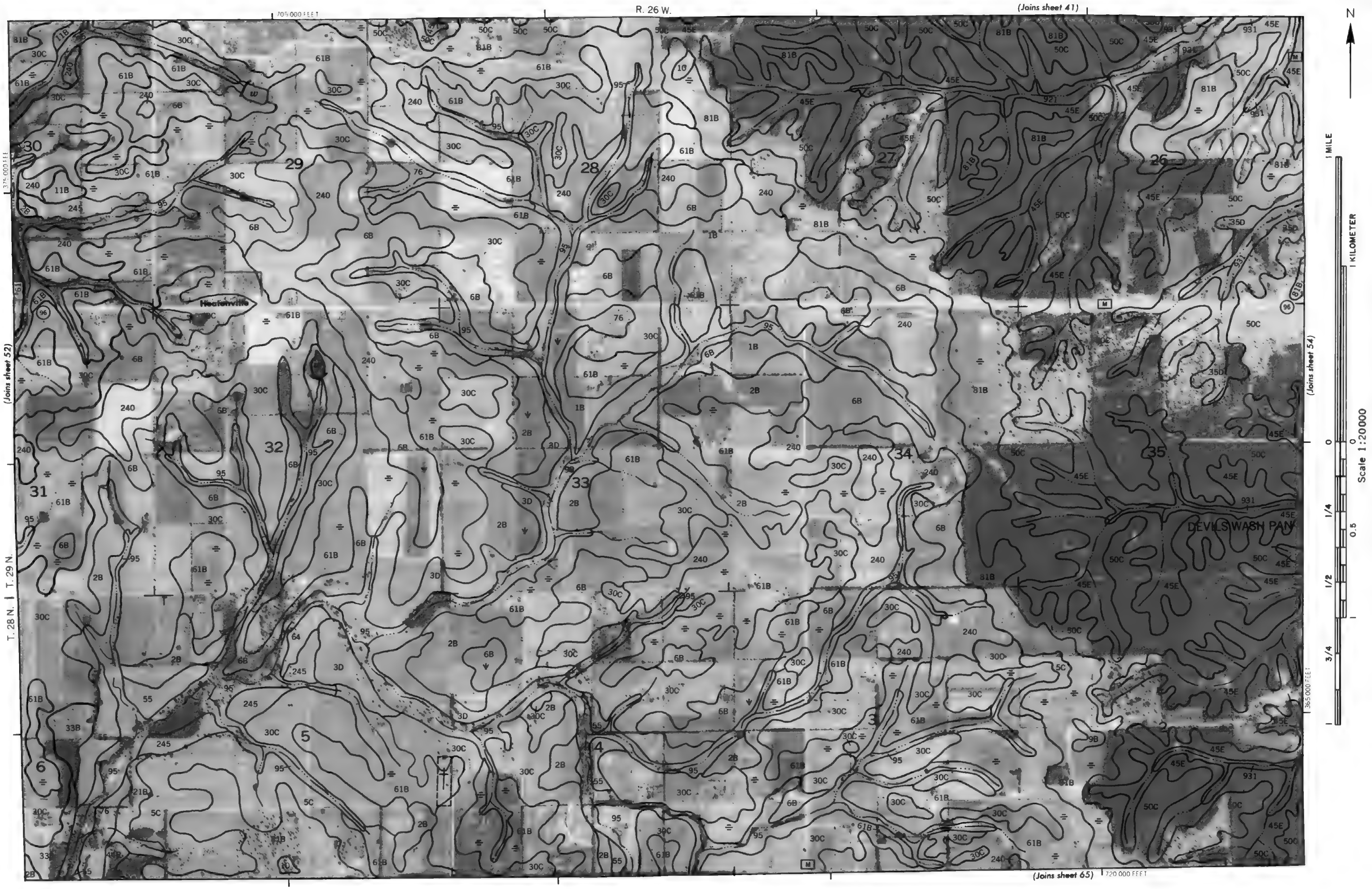
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 52



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

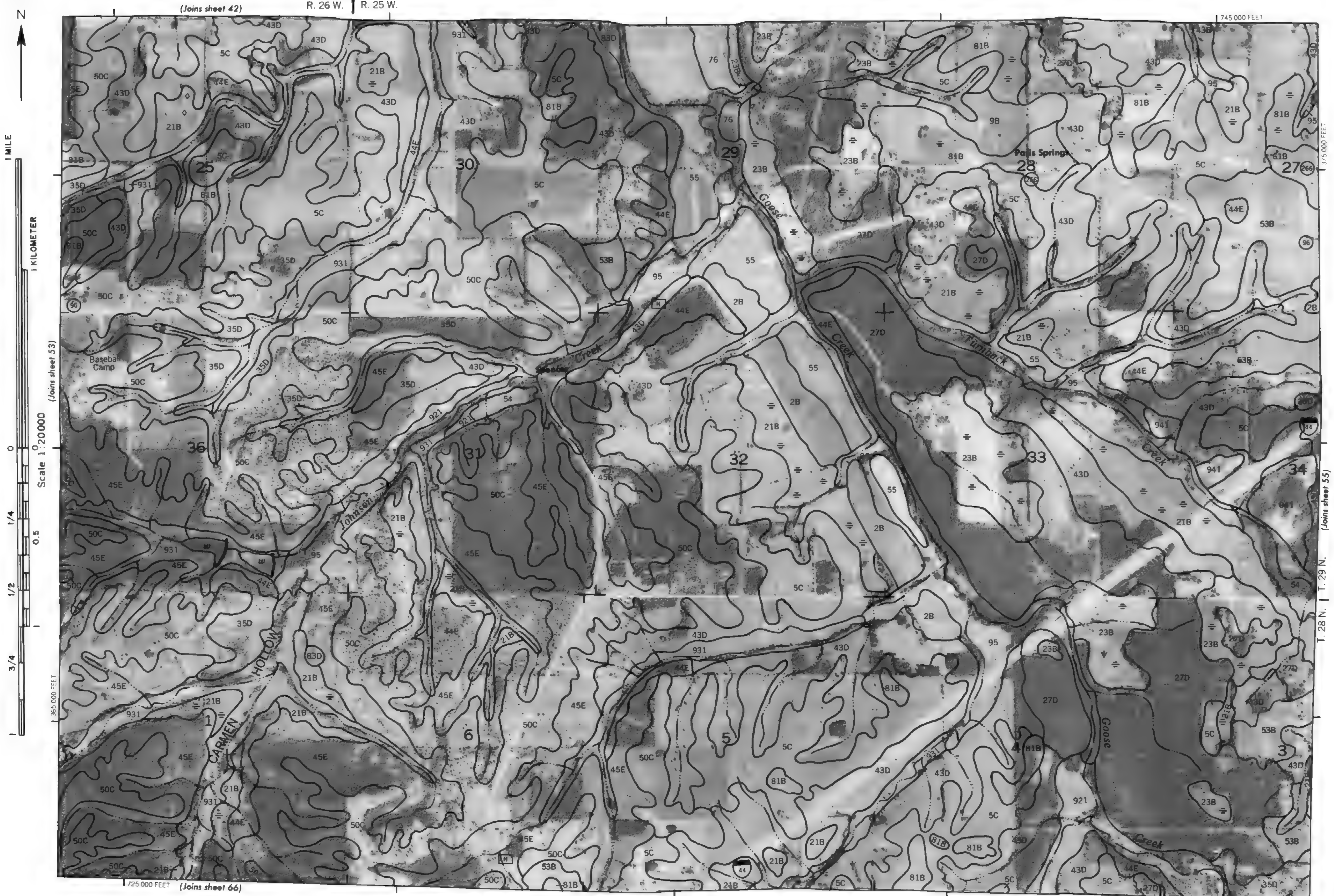
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 53



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 53

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

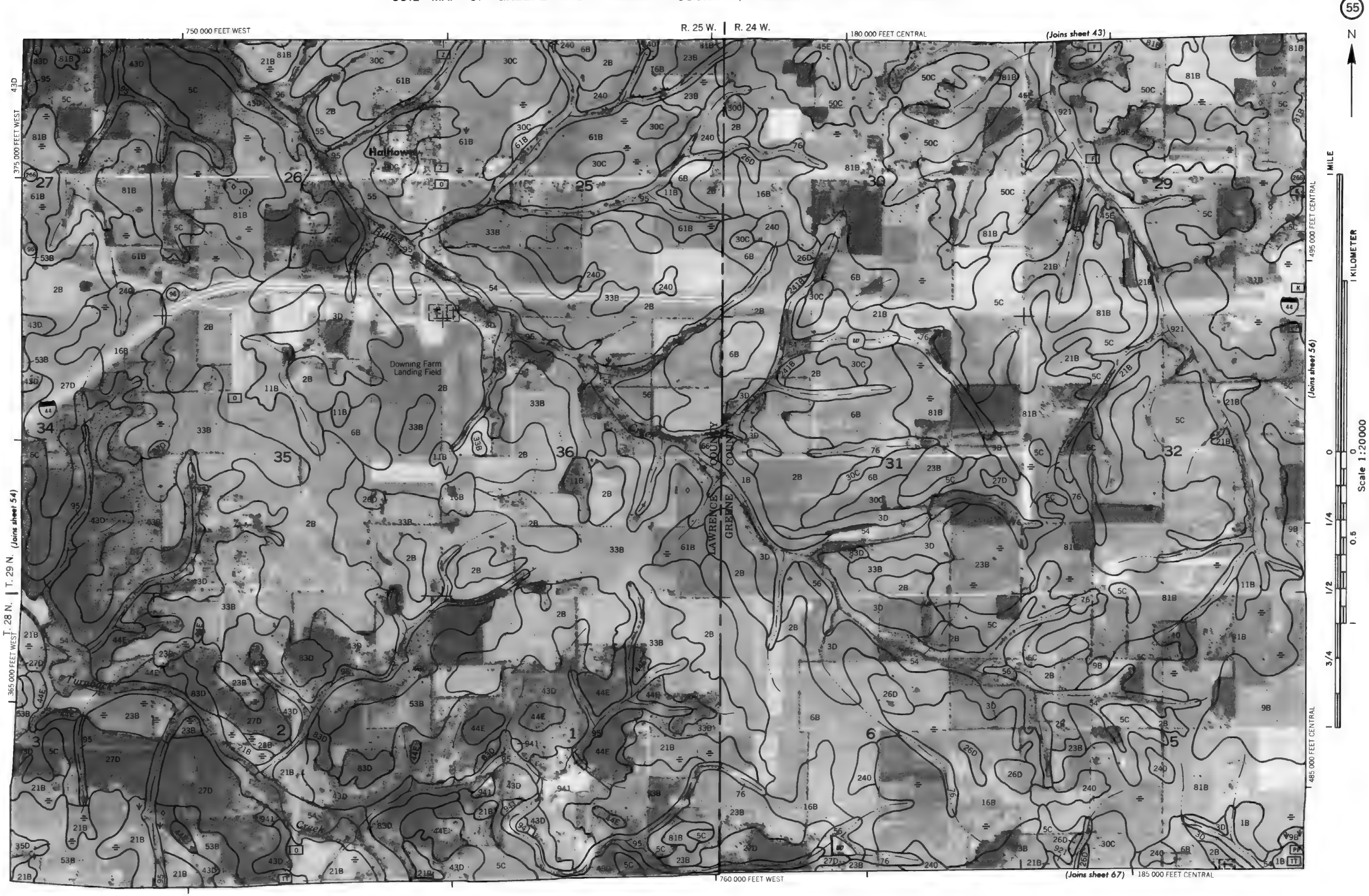
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 54



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 54

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 55



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 55

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners if shown are approximately positioned.

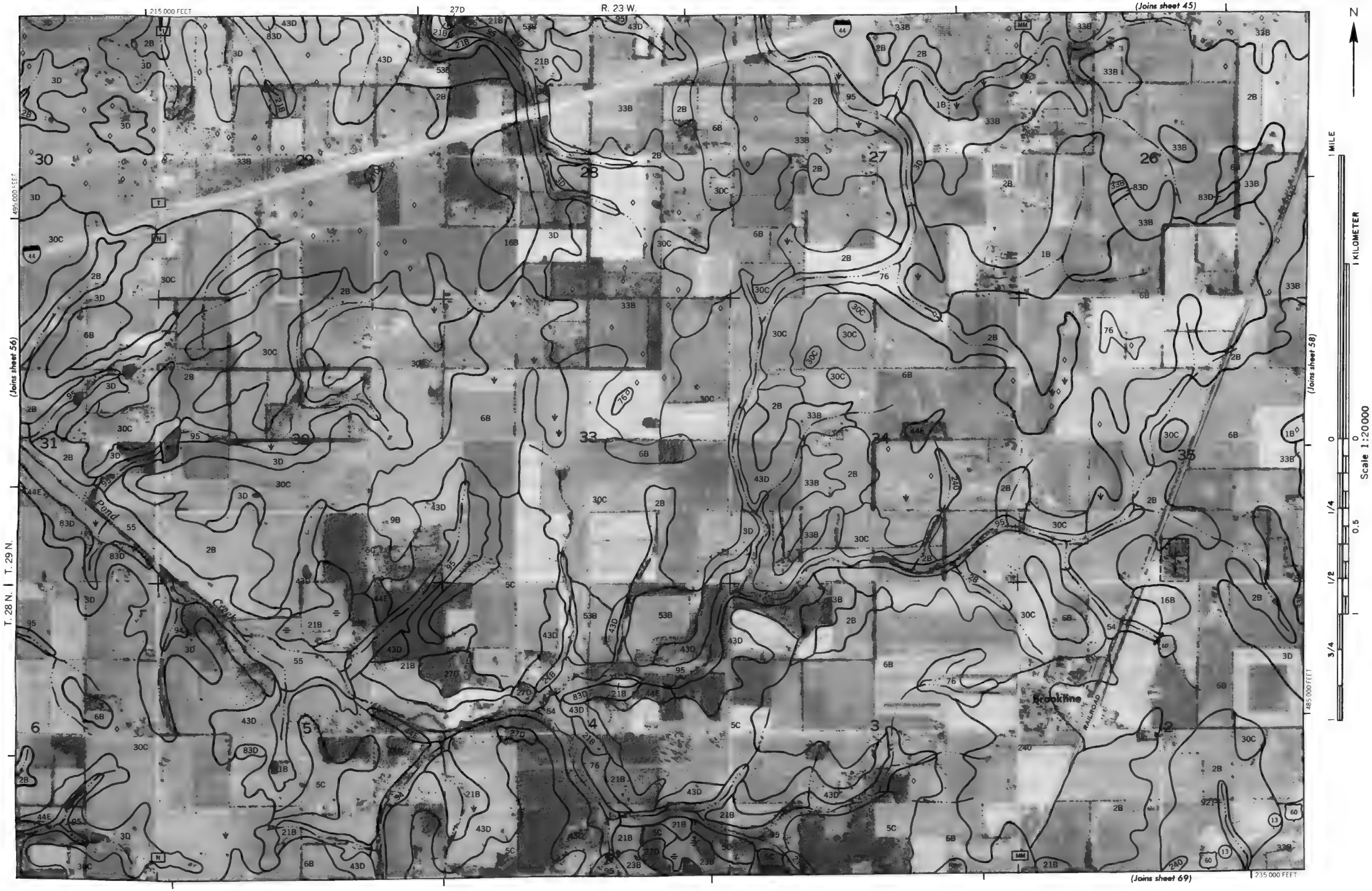
56

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 56

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 56

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 57

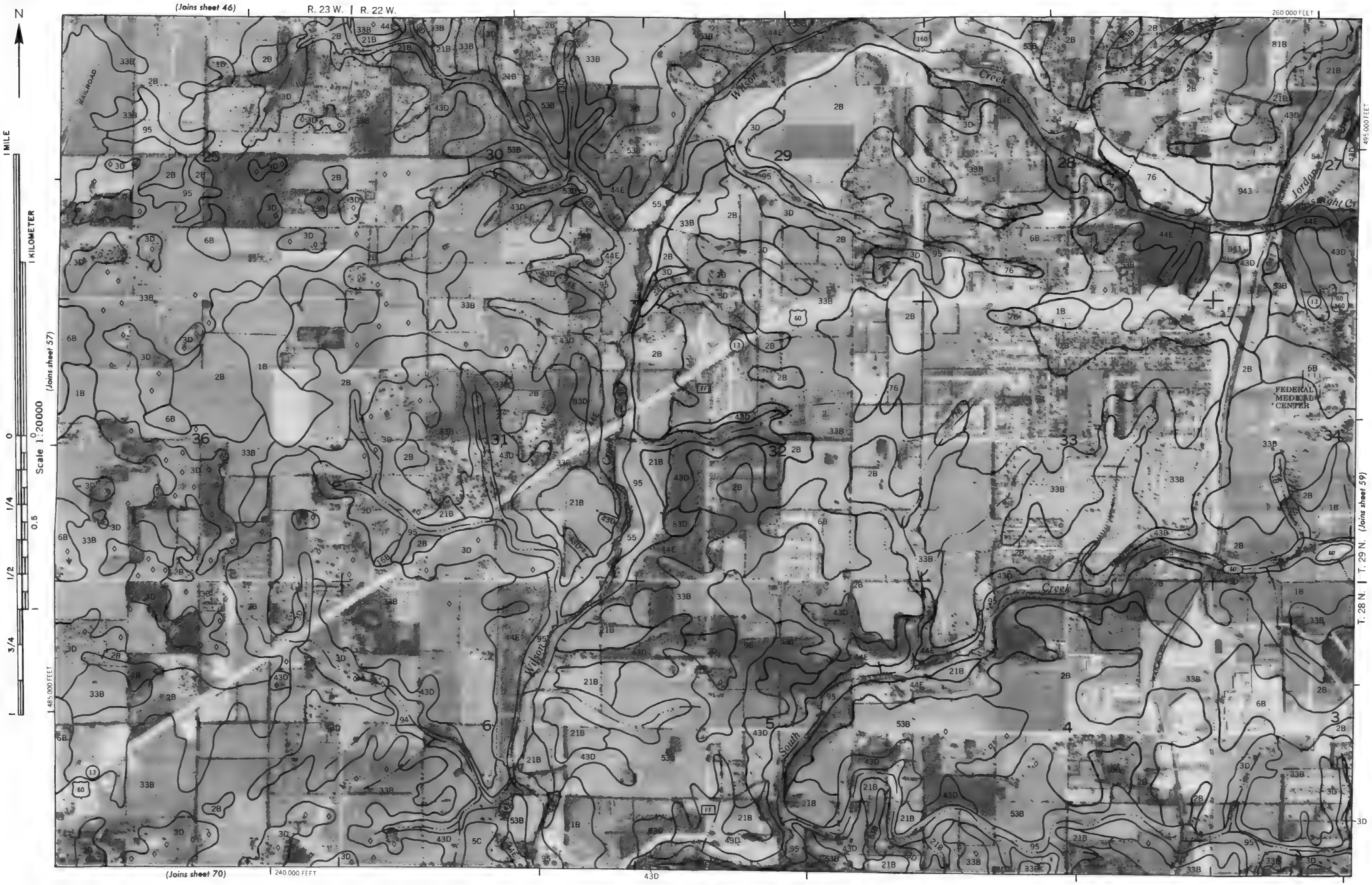


GREENE & LAWRENCE COUNTIES, MISSOURI NO. 57

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 58

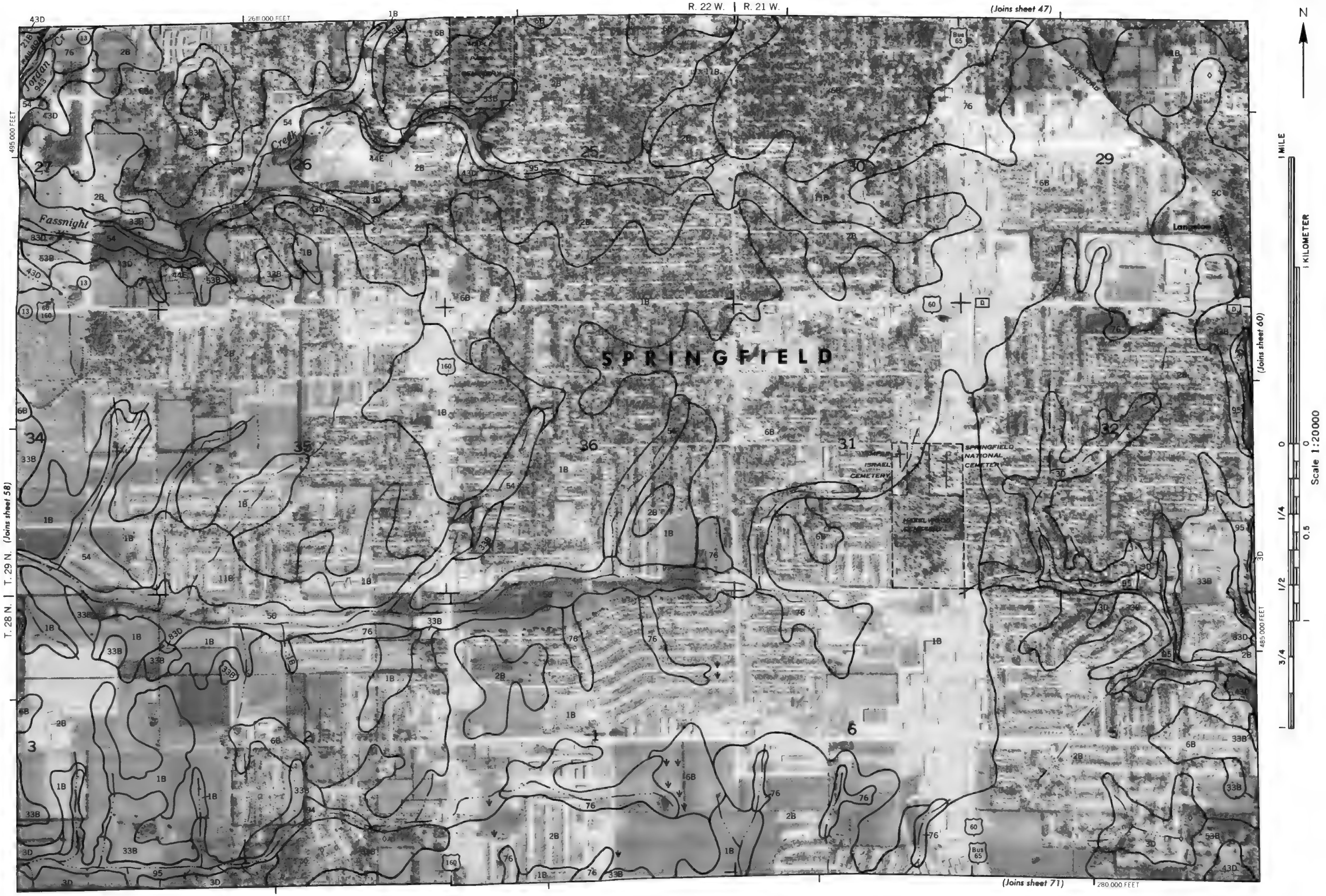
58



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 58

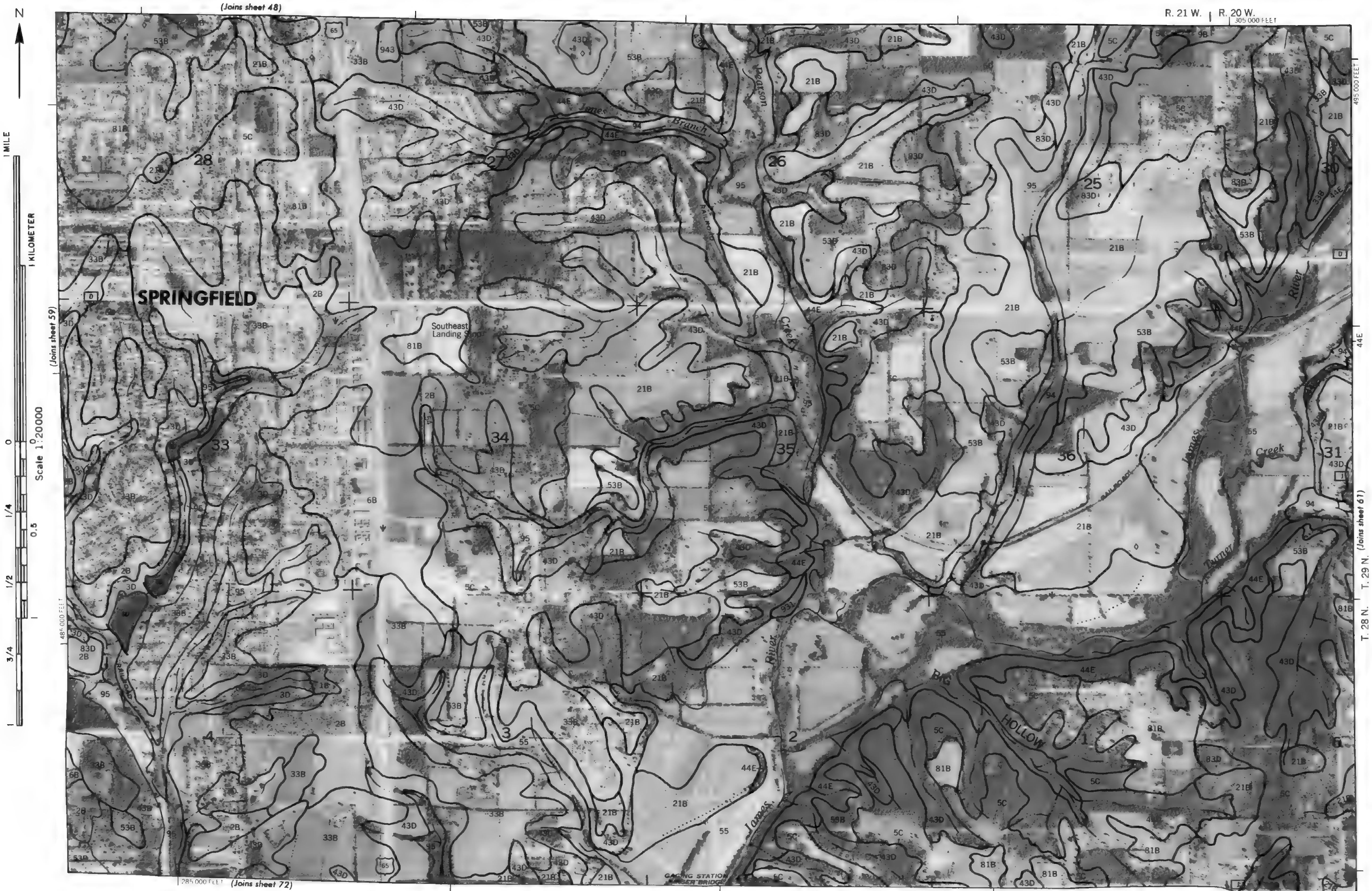
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 59



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 59

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 60

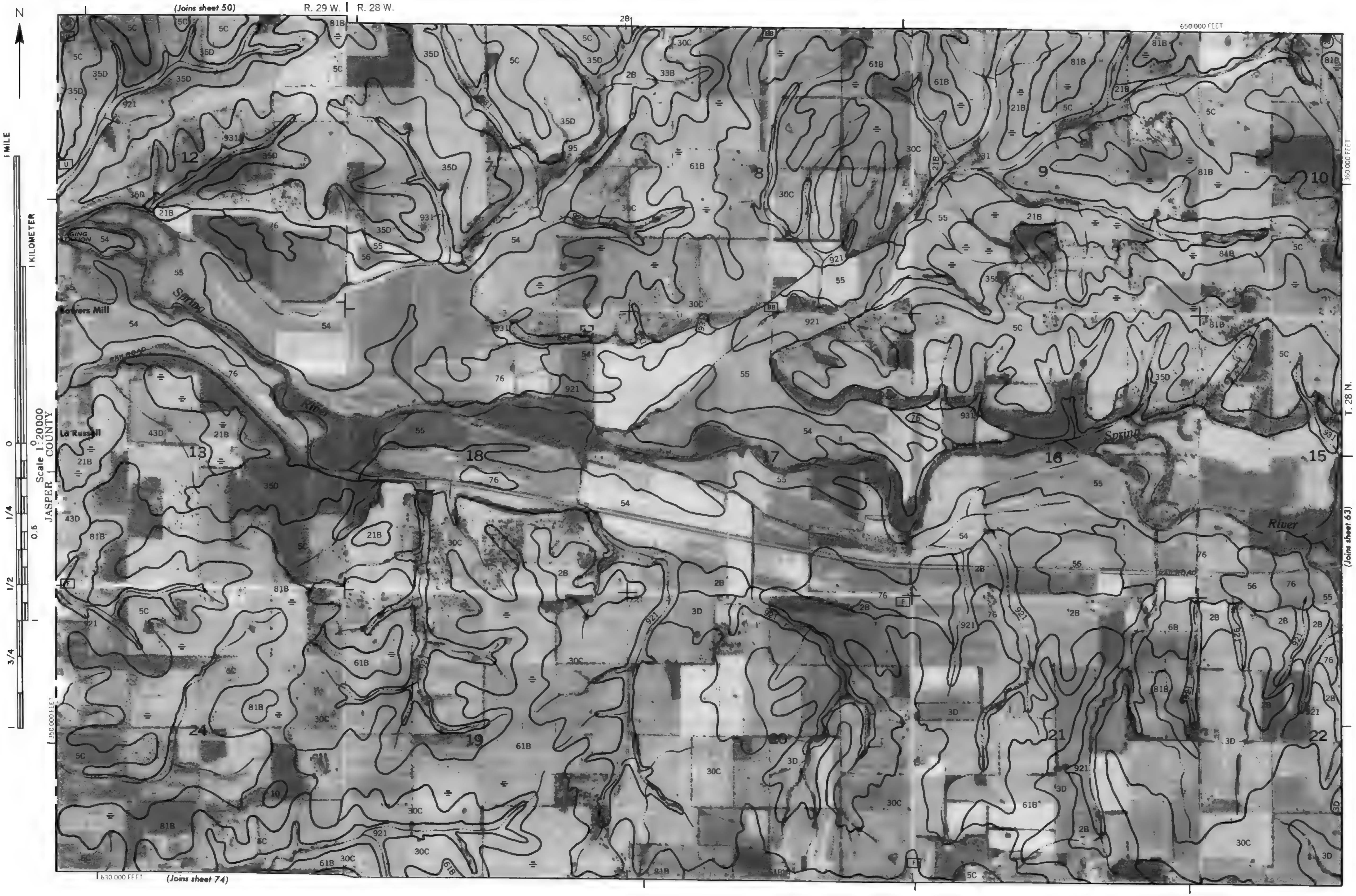


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners if shown are approximately positioned

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 61

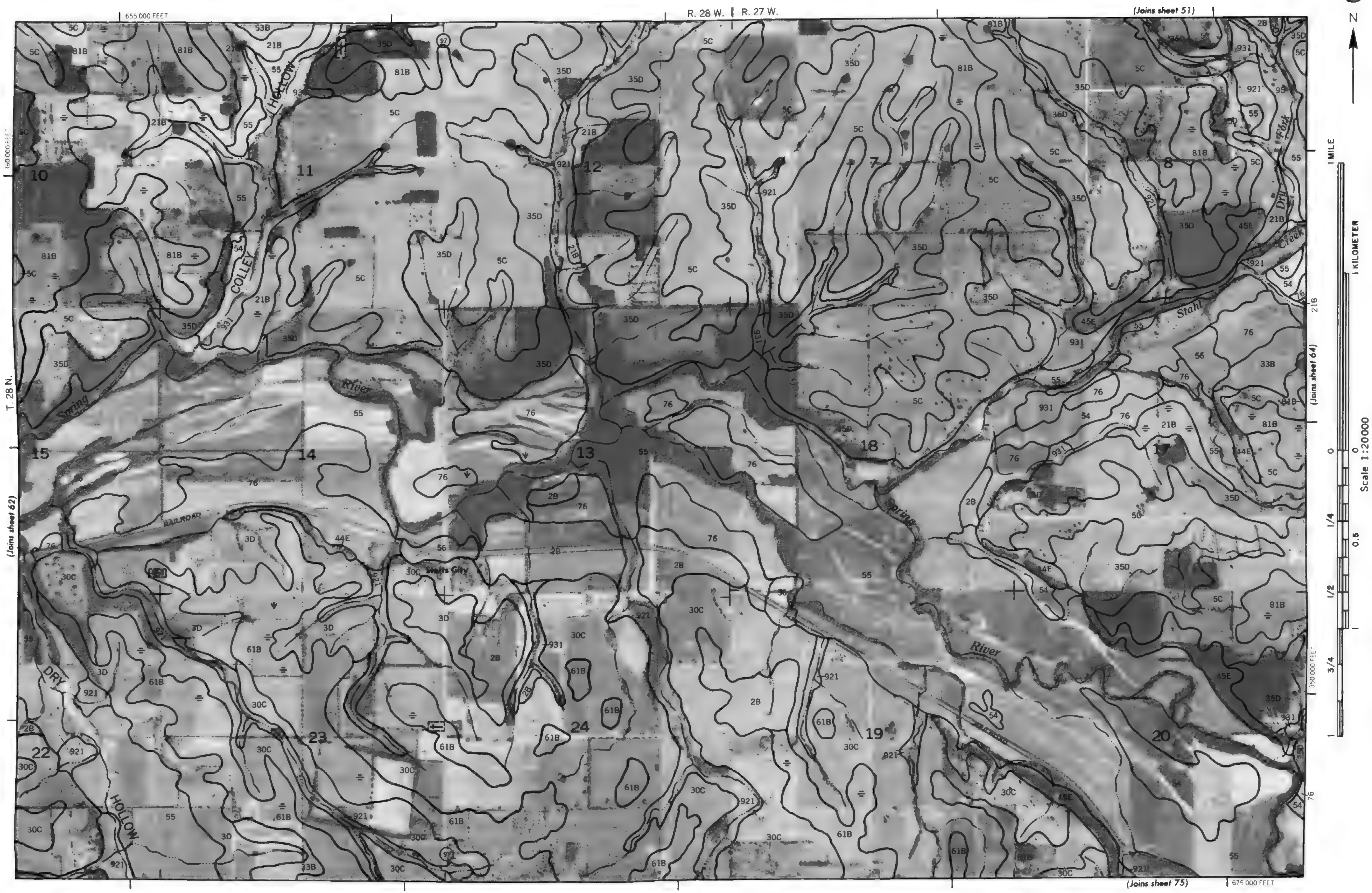
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 62



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners if shown are approximately positioned

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 63



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 63

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

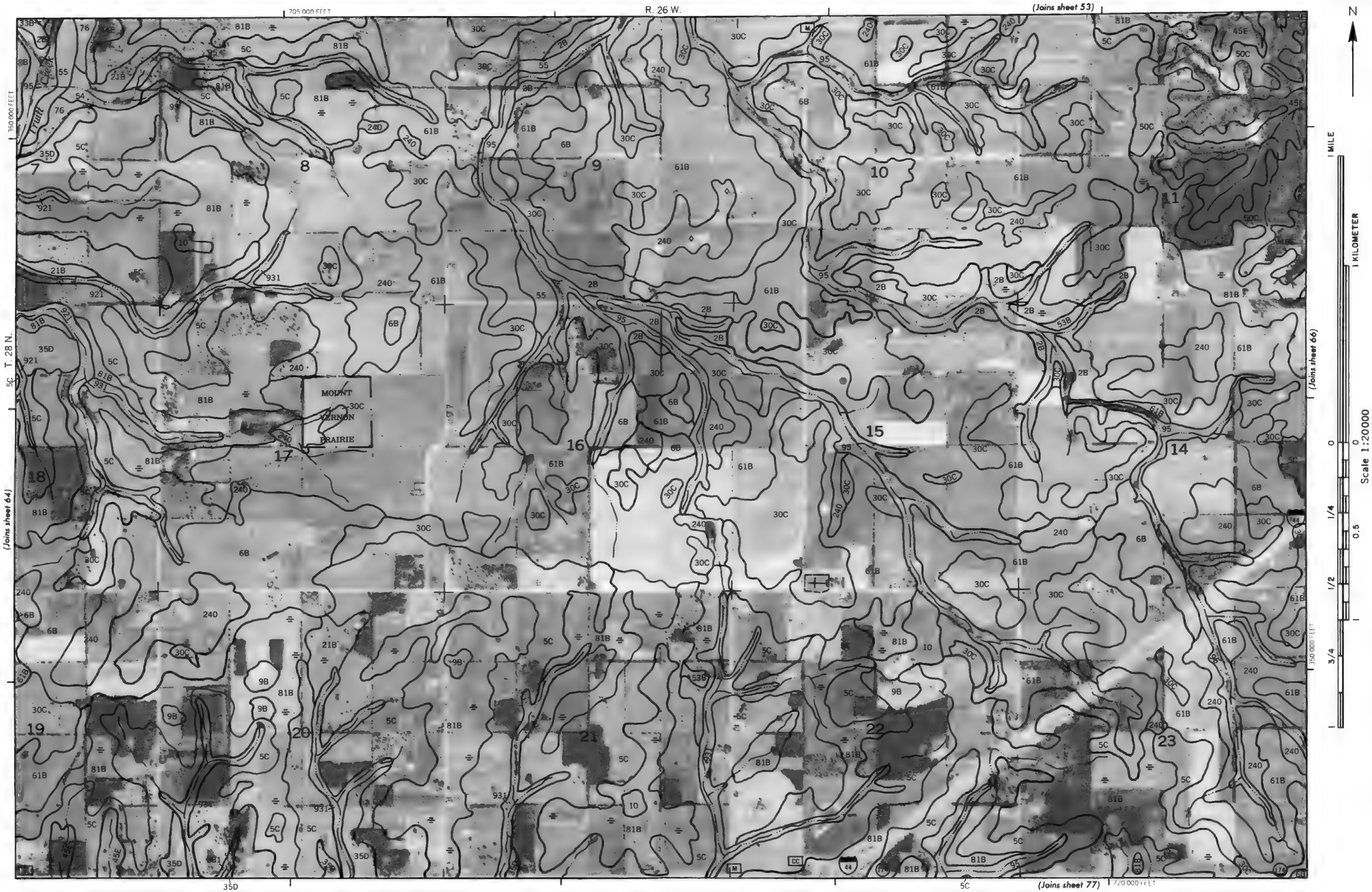
64

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 64

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 64

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 65



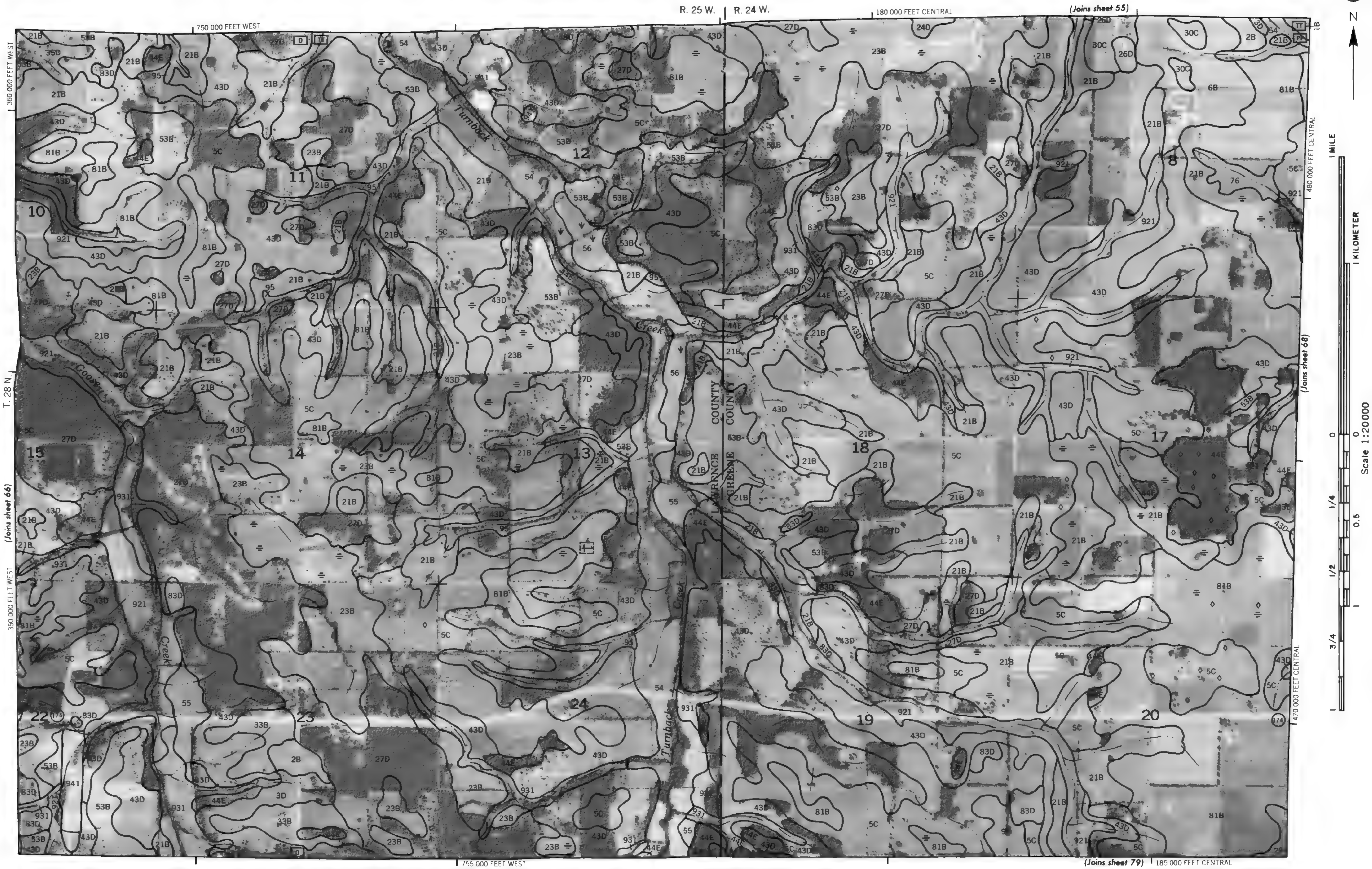
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 65

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 66

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and division corners, if shown, are approximately positioned

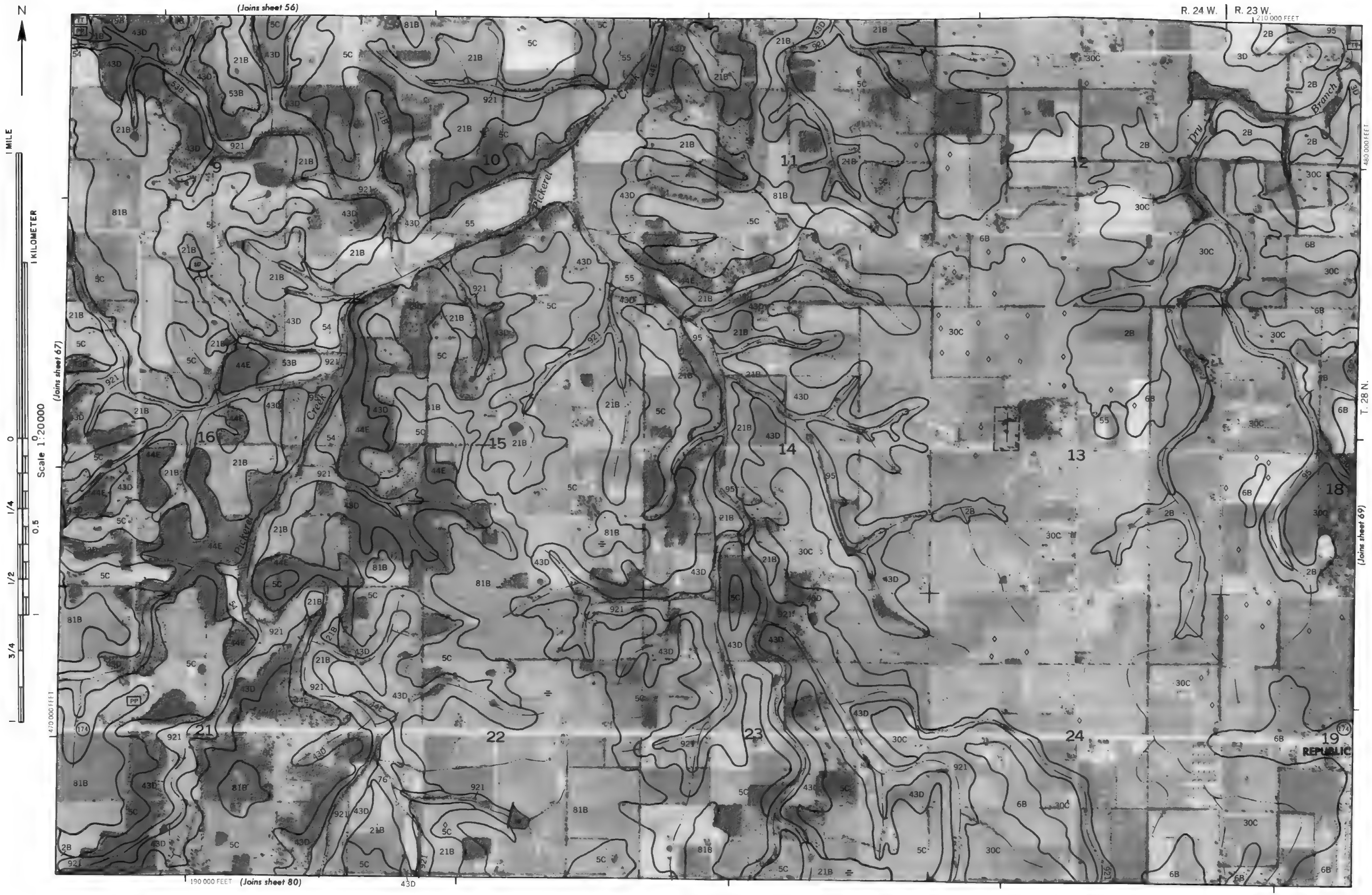
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 66



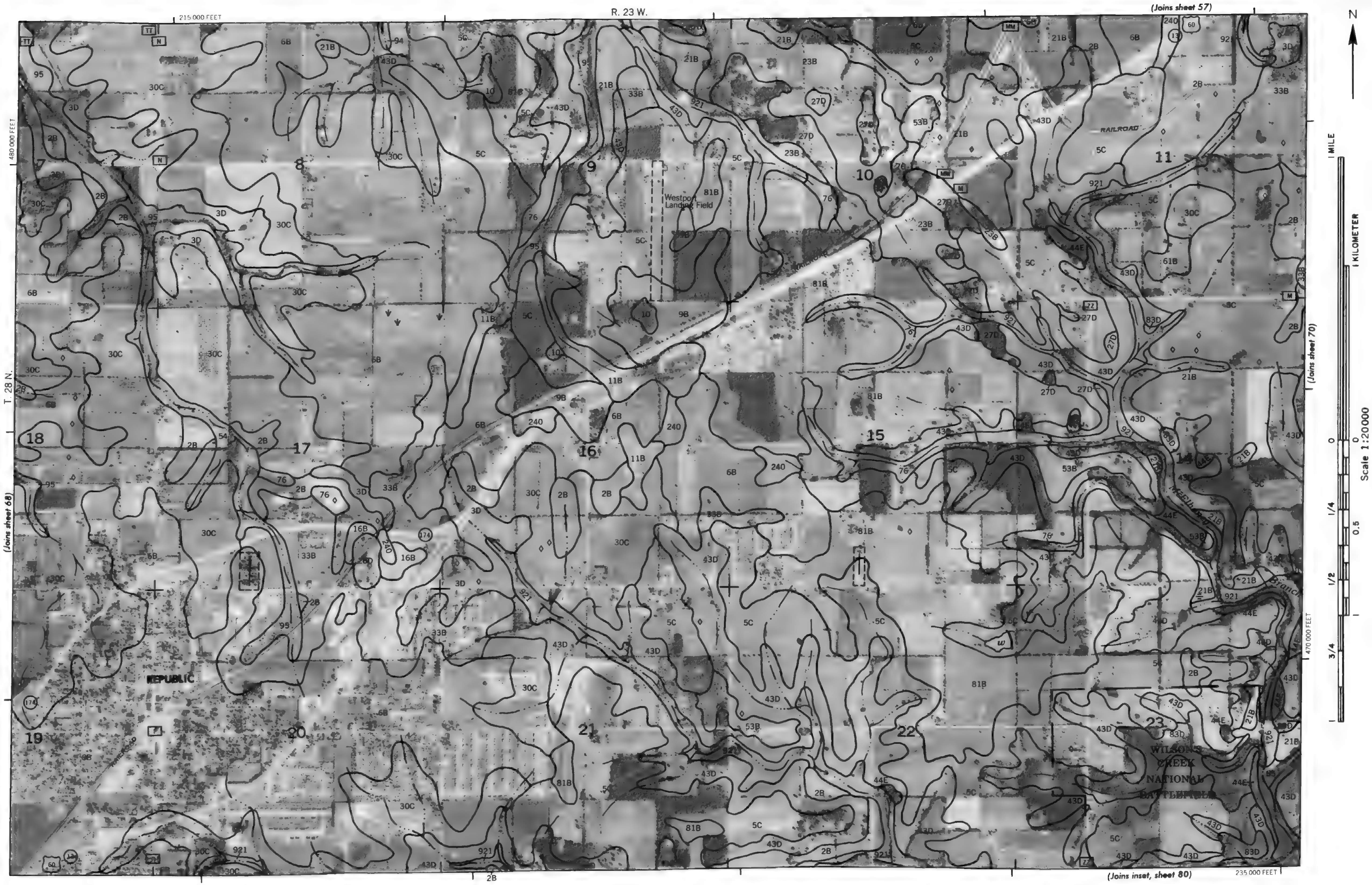
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 67

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 68



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 69

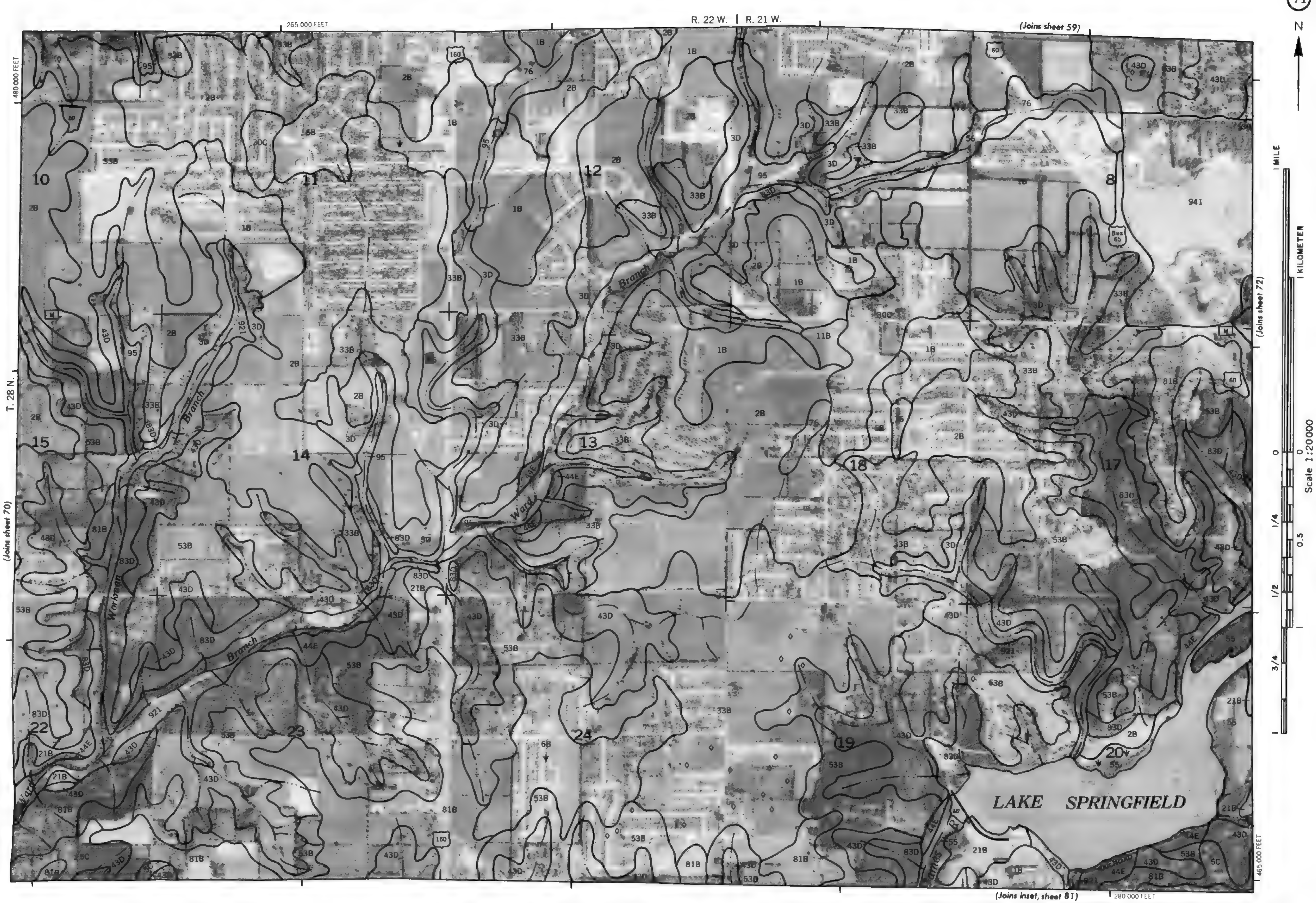
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 70

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 70

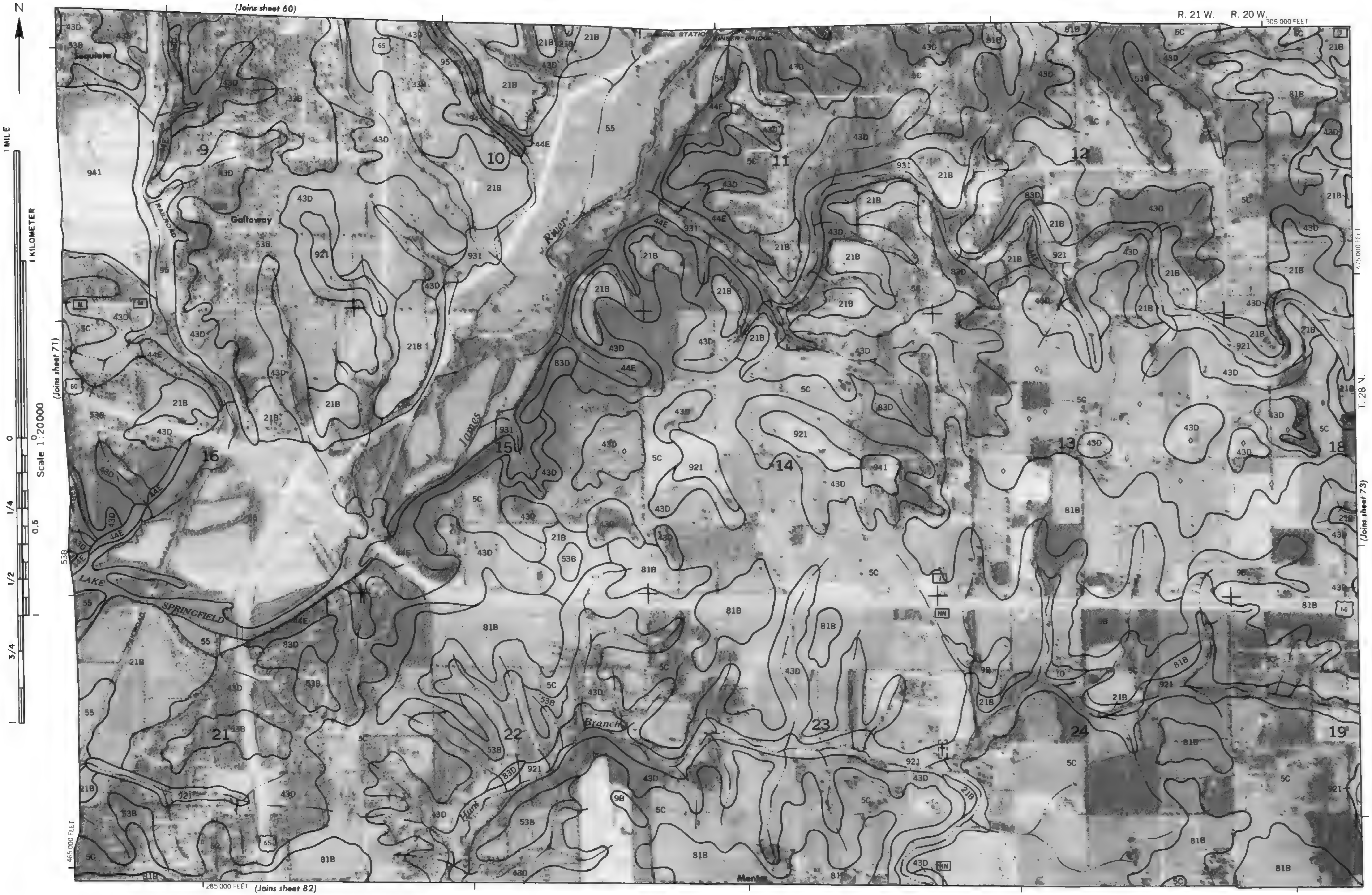
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 71



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 71

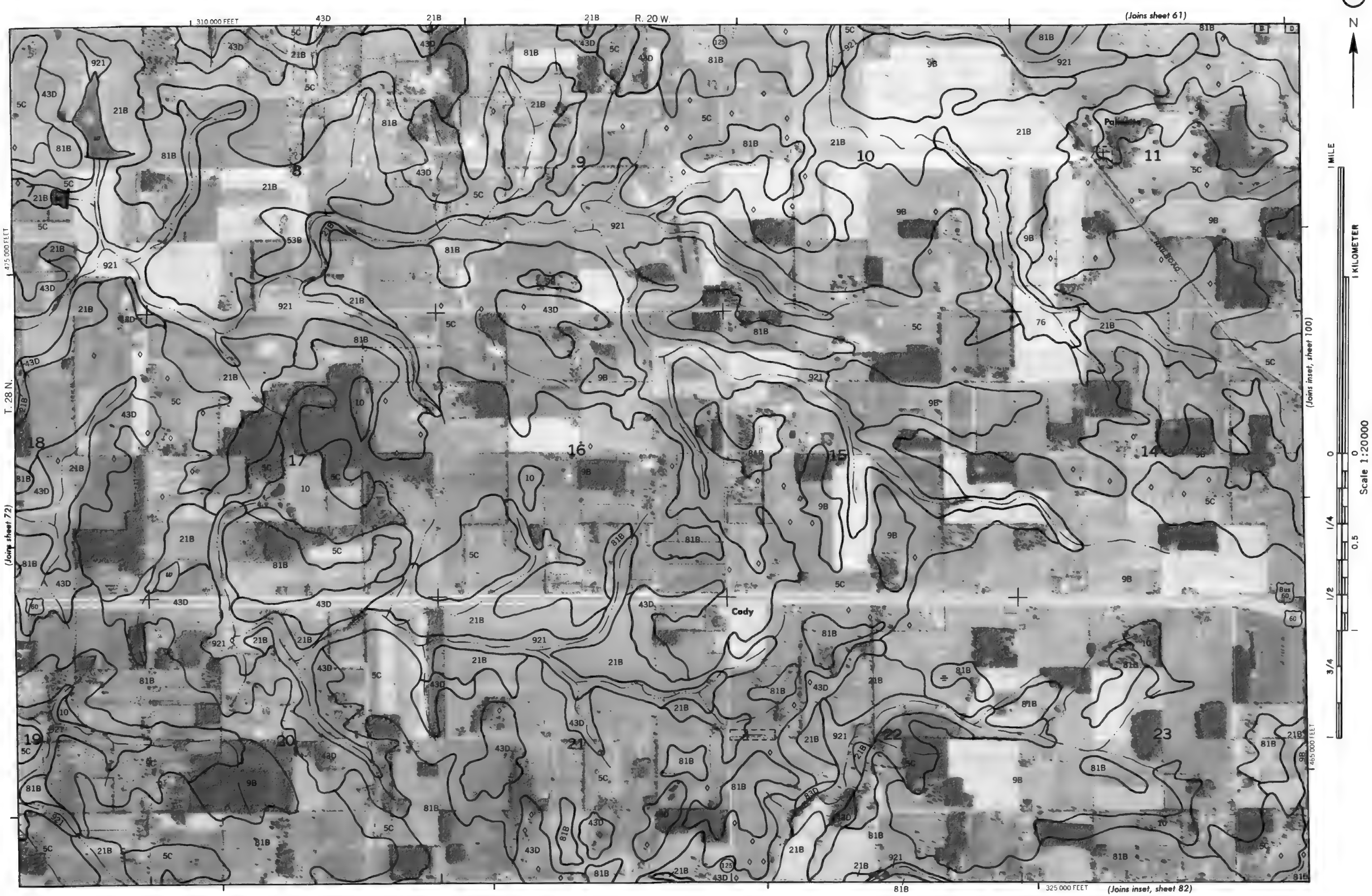
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperative agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 72



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 73

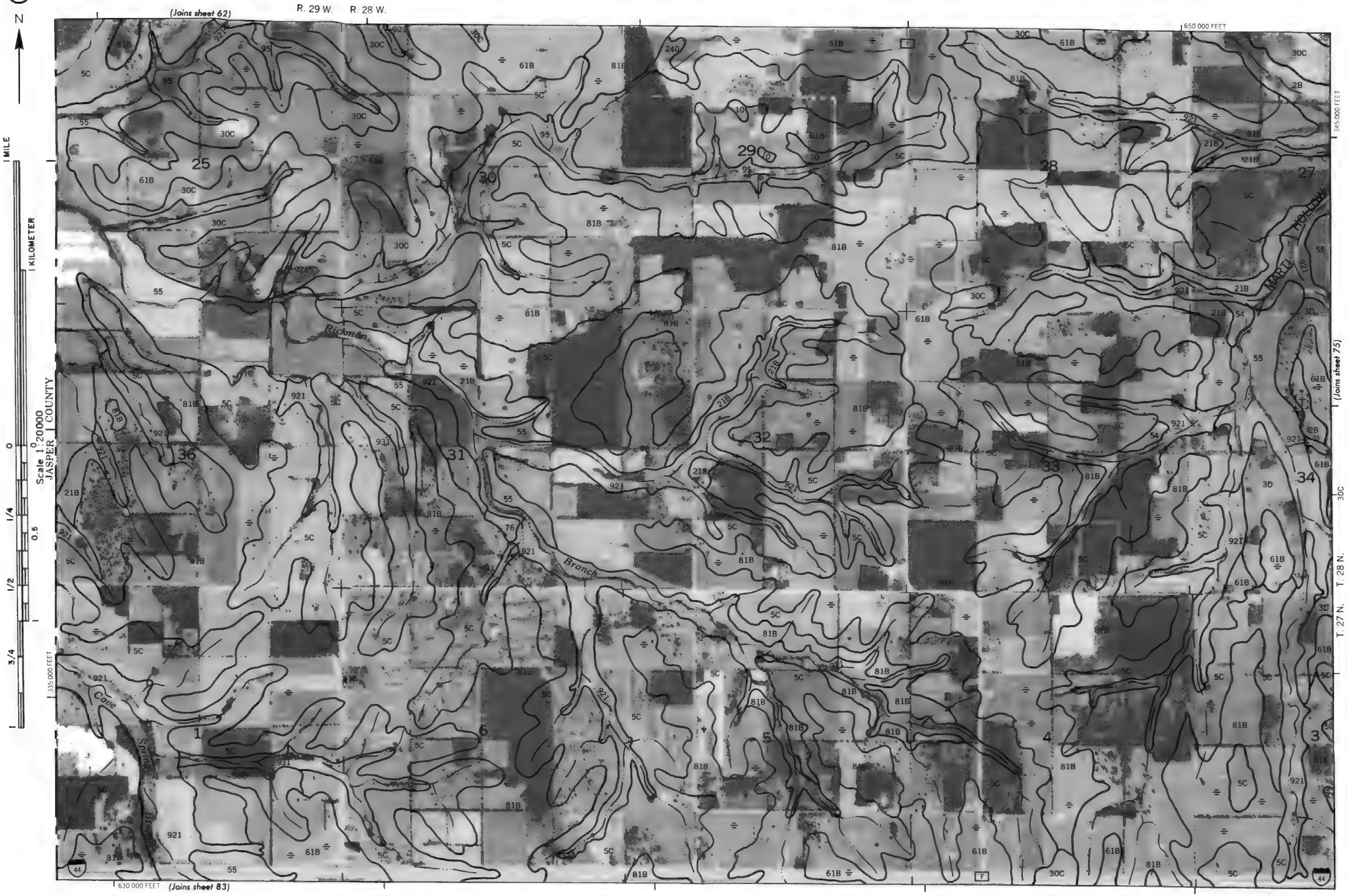


GREENE & LAWRENCE COUNTIES, MISSOURI NO. 73

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

74

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 74

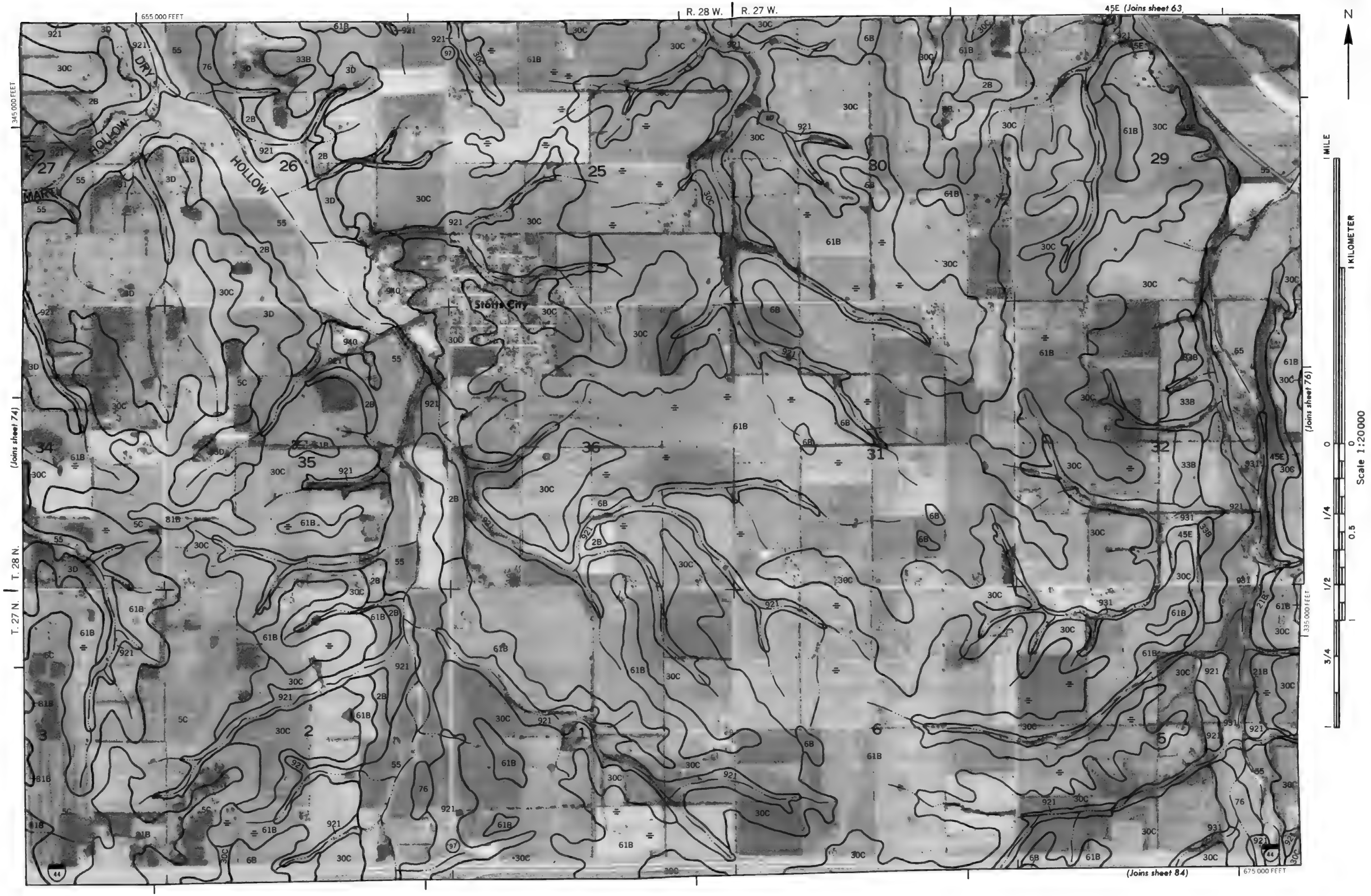


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 74

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 75

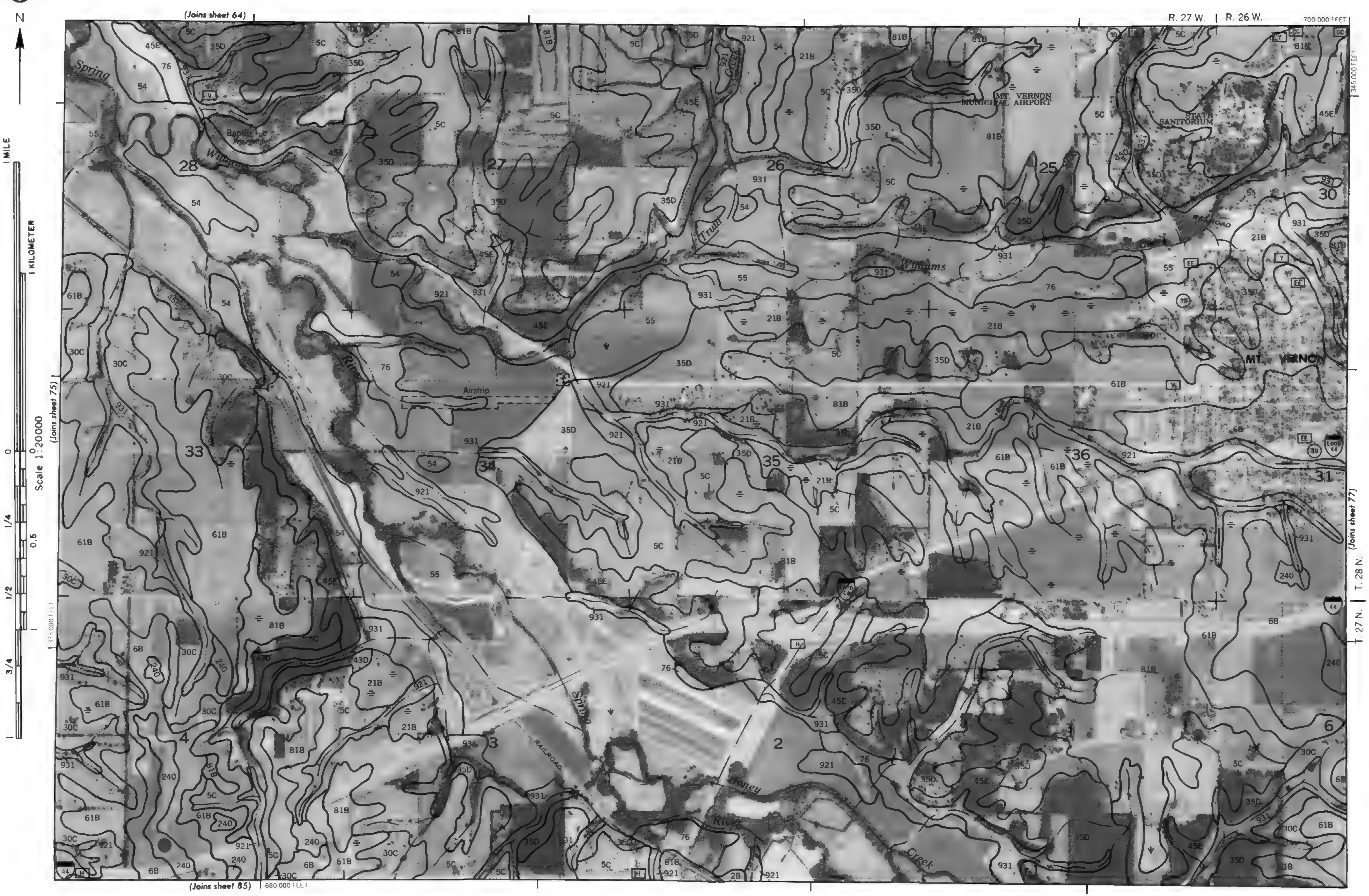
75



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 75

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

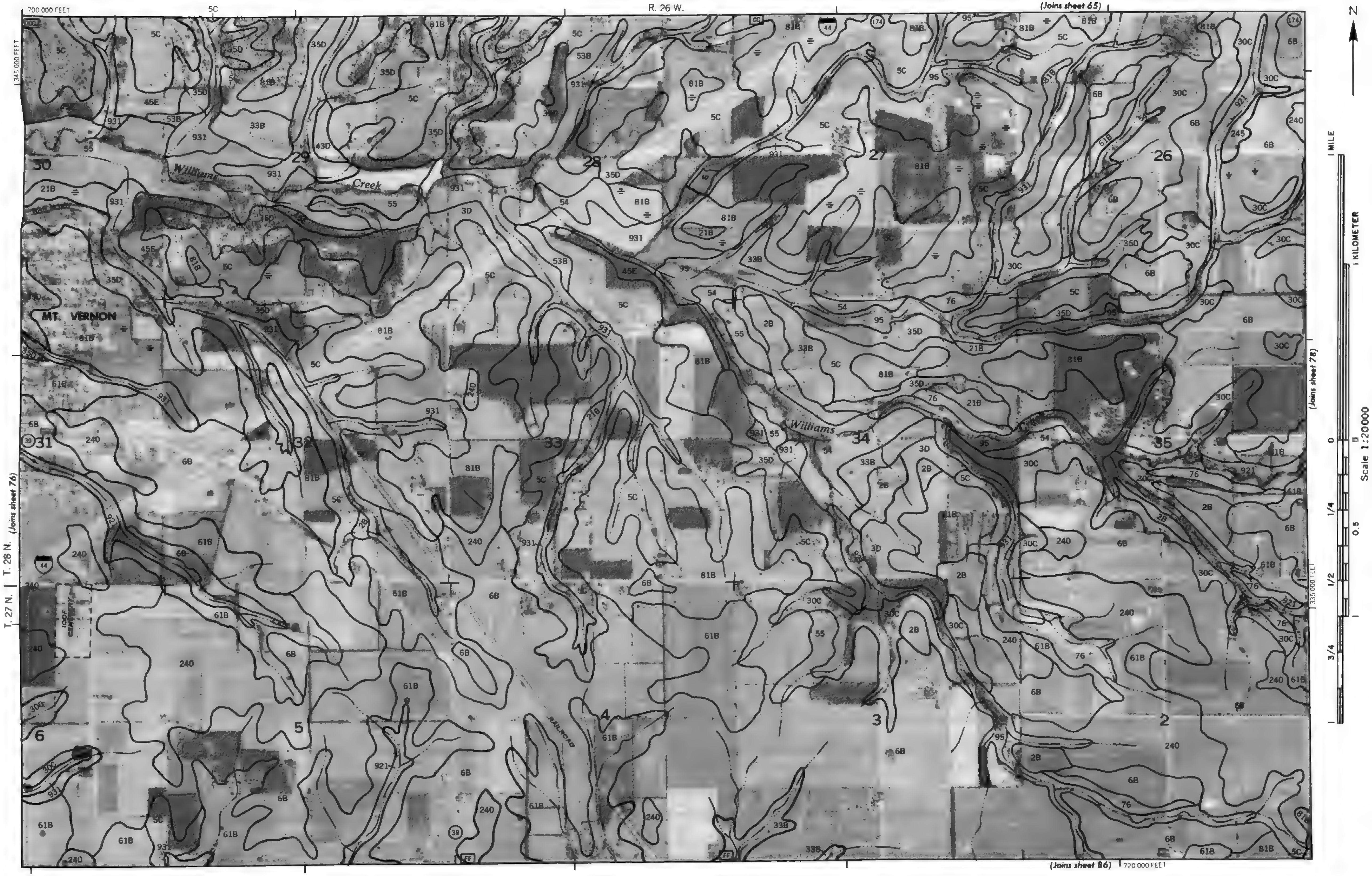
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 76



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 76

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 77



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 77

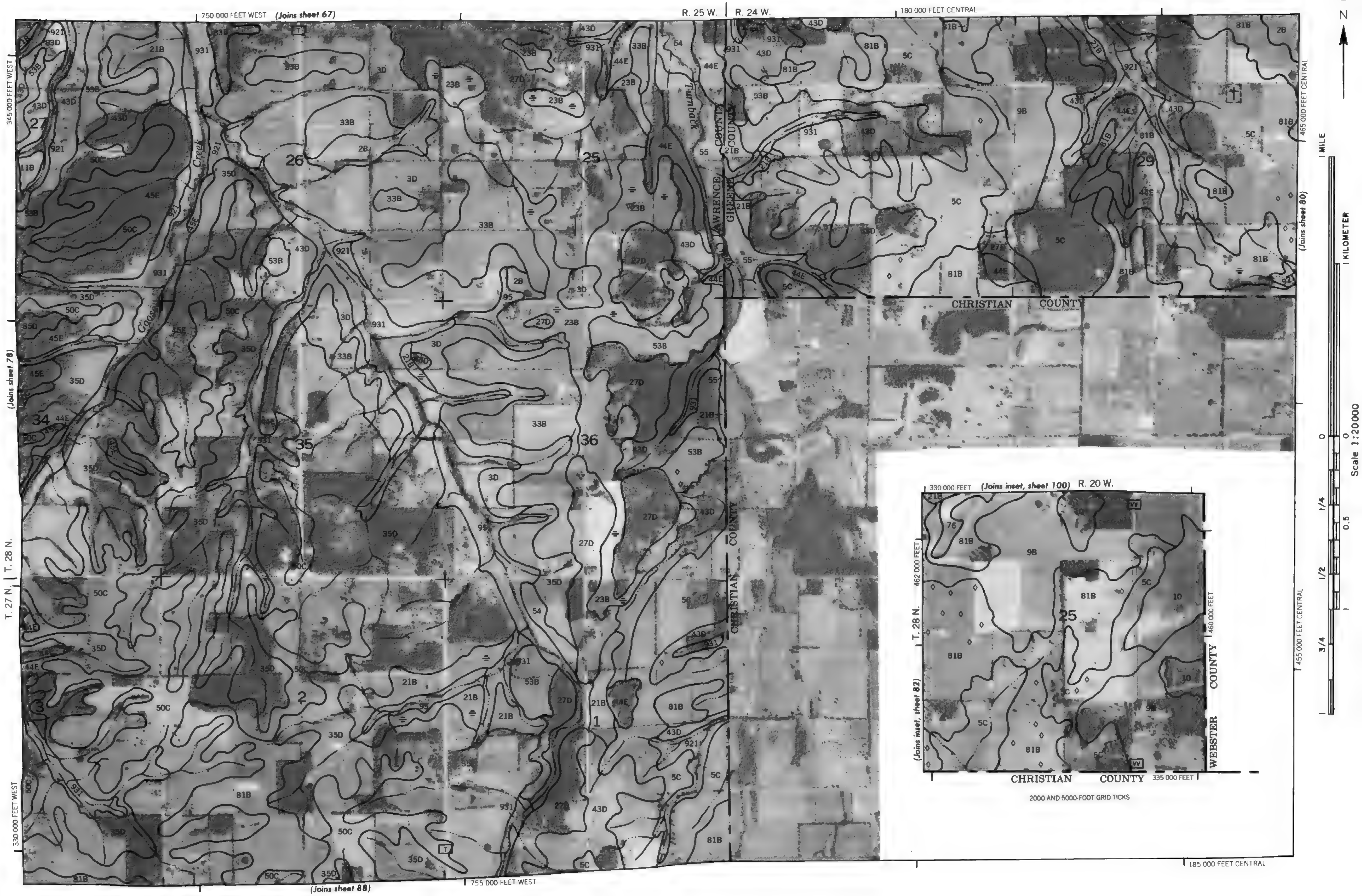
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

78

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 78

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 78



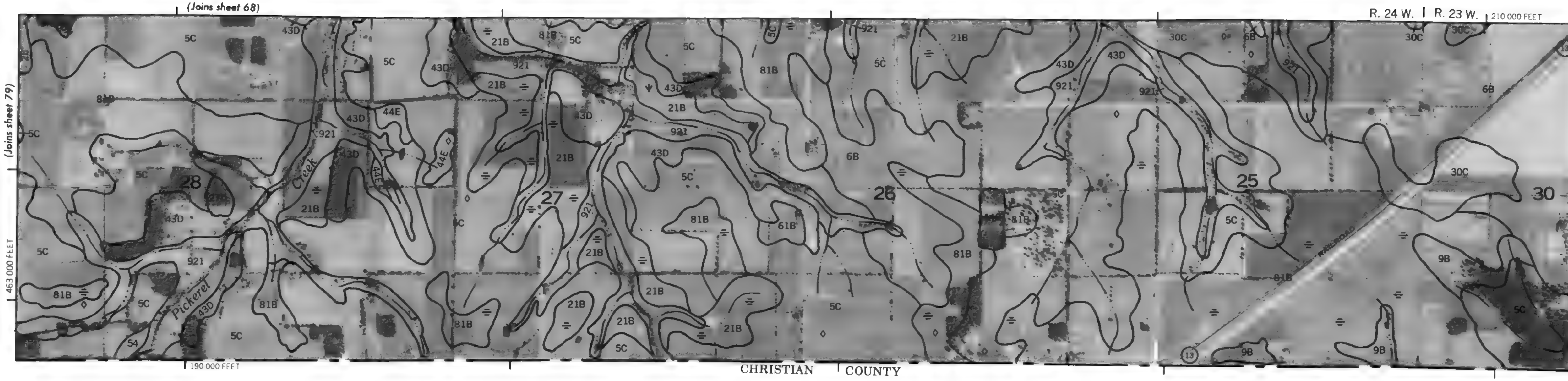
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 79

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

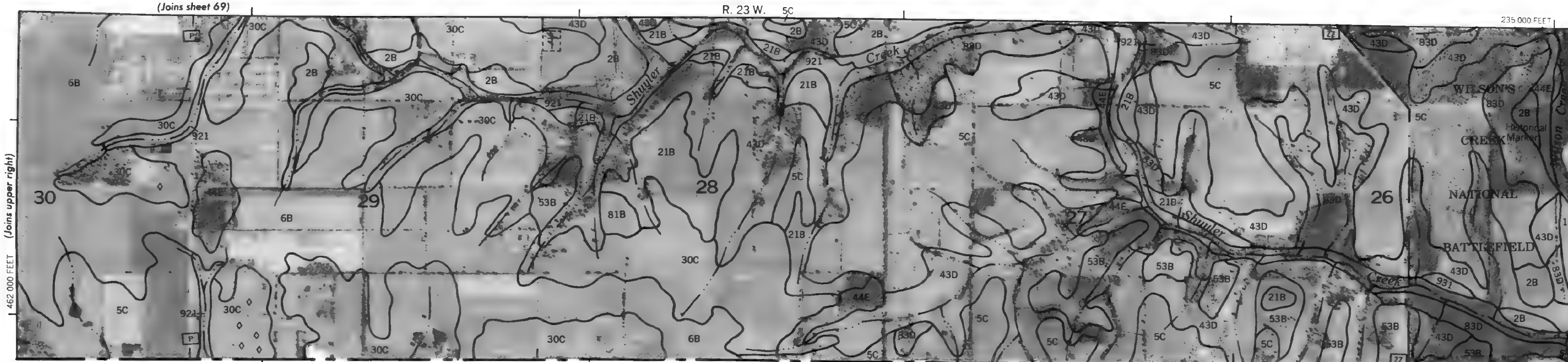
(80)

N

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 80



2000 AND 5000-FOOT GRID TICKS



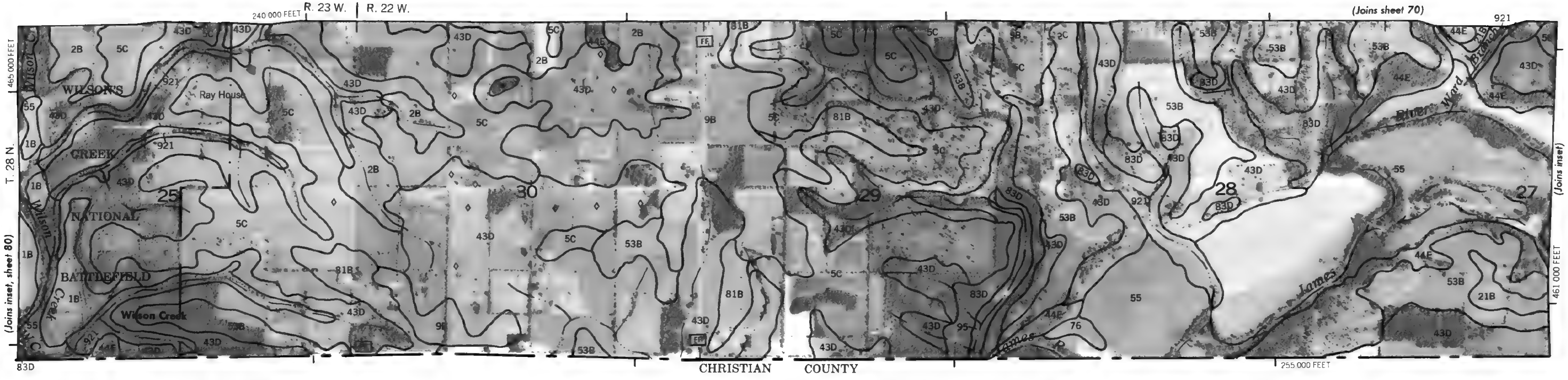
3000 AND 5000 FOOT GRID TICKS

1 MILE
1 KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
1

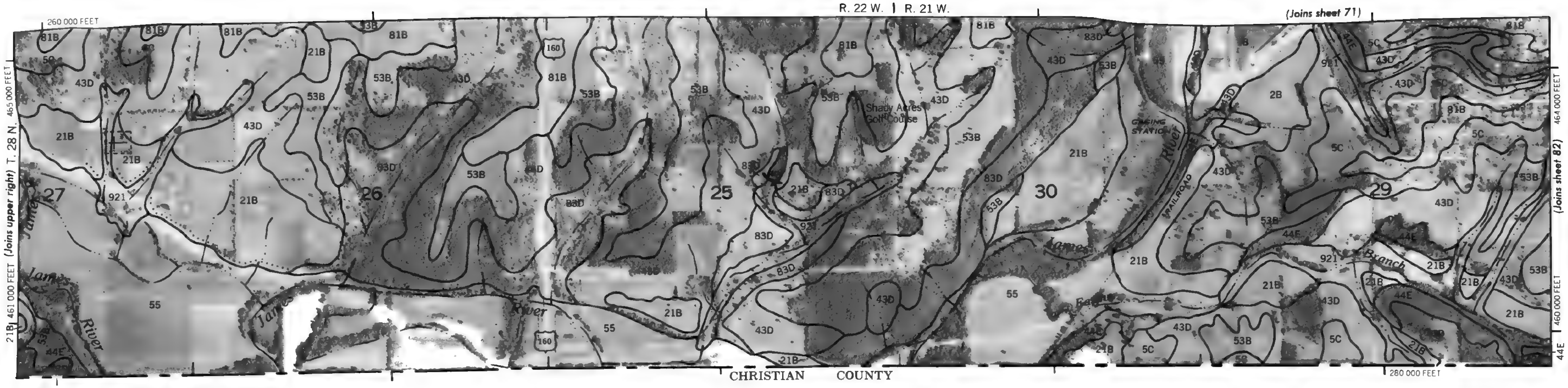
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 80

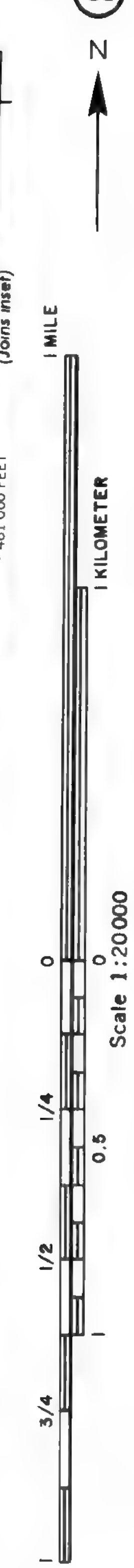
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 81



4000 AND 5000-FOOT GRID TICKS



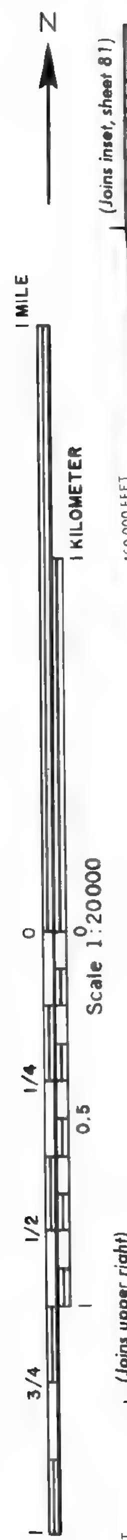
4000 AND 5000-FOOT GRID TICKS

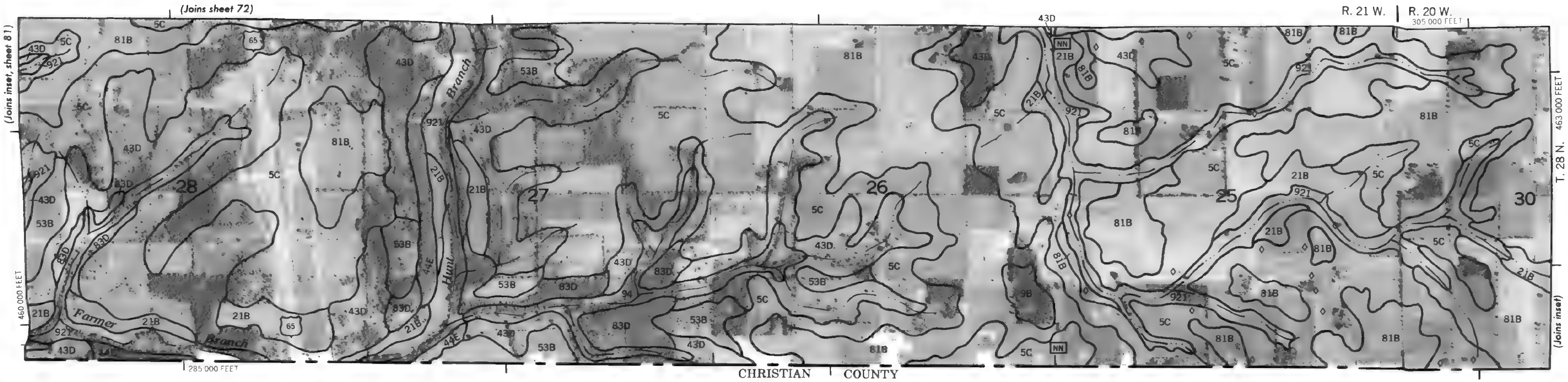


GREENE & LAWRENCE COUNTIES, MISSOURI NO. 81

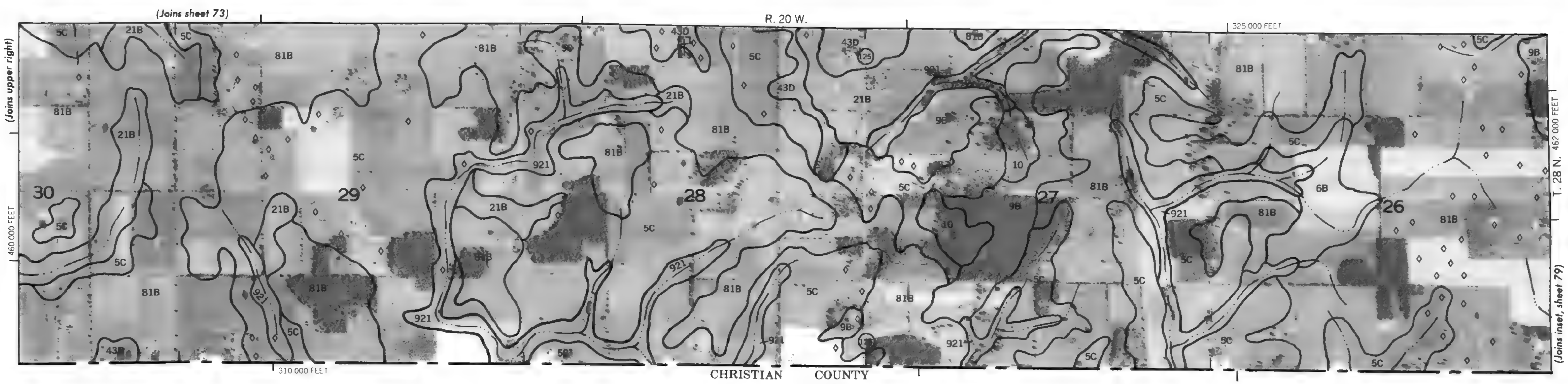
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 82





3000 AND 5000-FOOT GRID TICKS

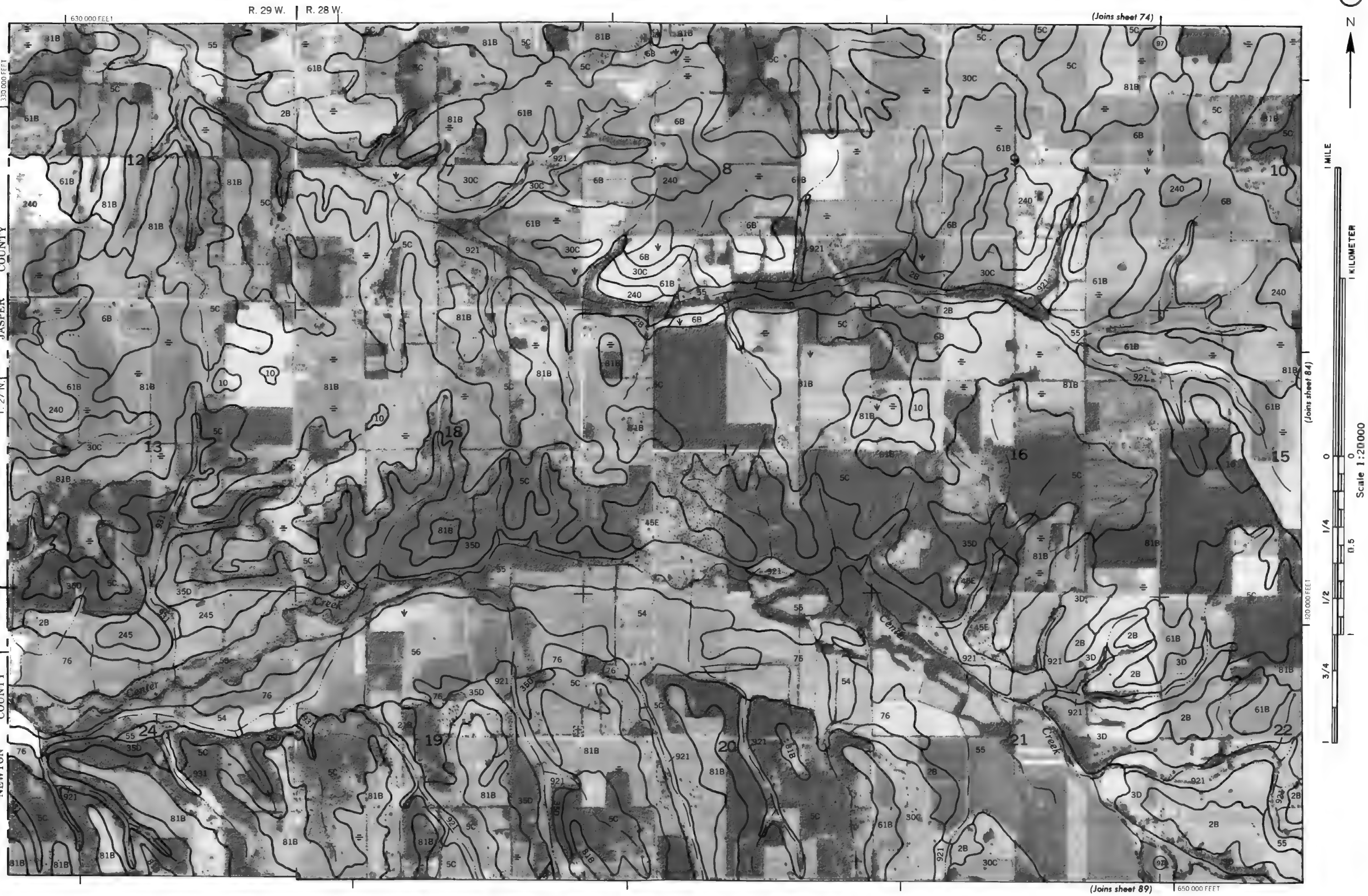


2000 AND 5000-FOOT GRID TICKS

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 82

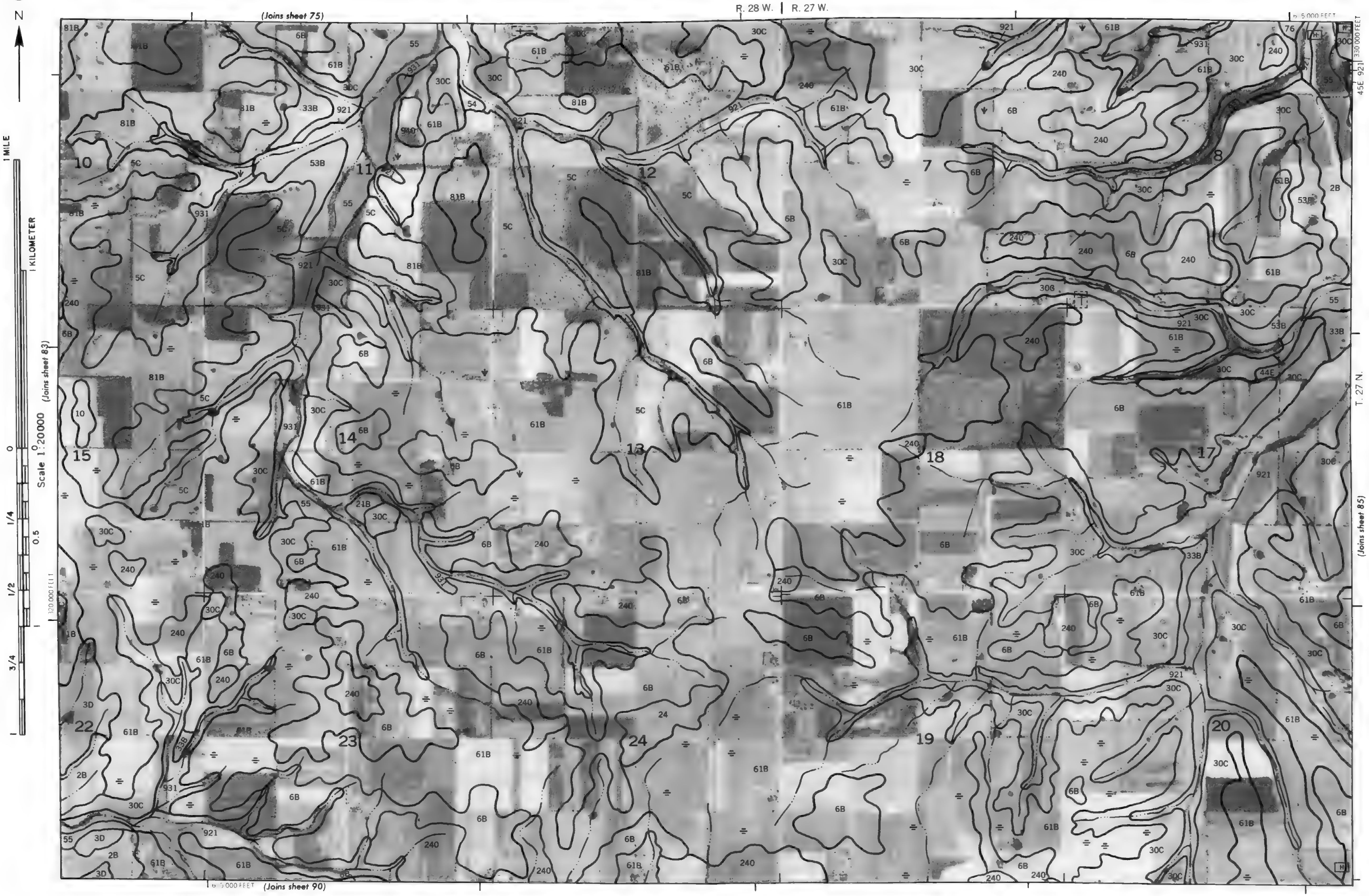
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 83



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 83

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

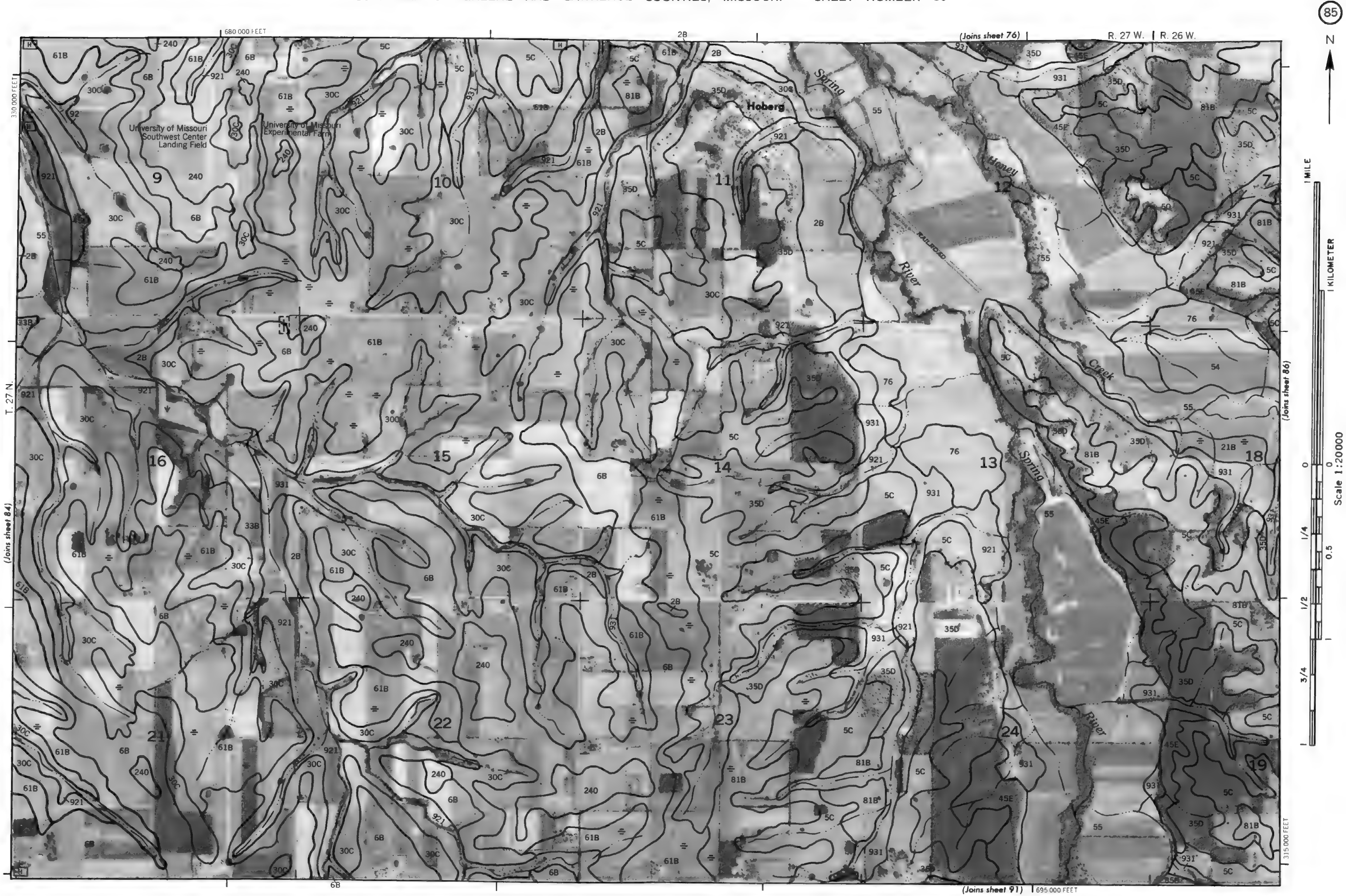
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 84



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 84

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 85



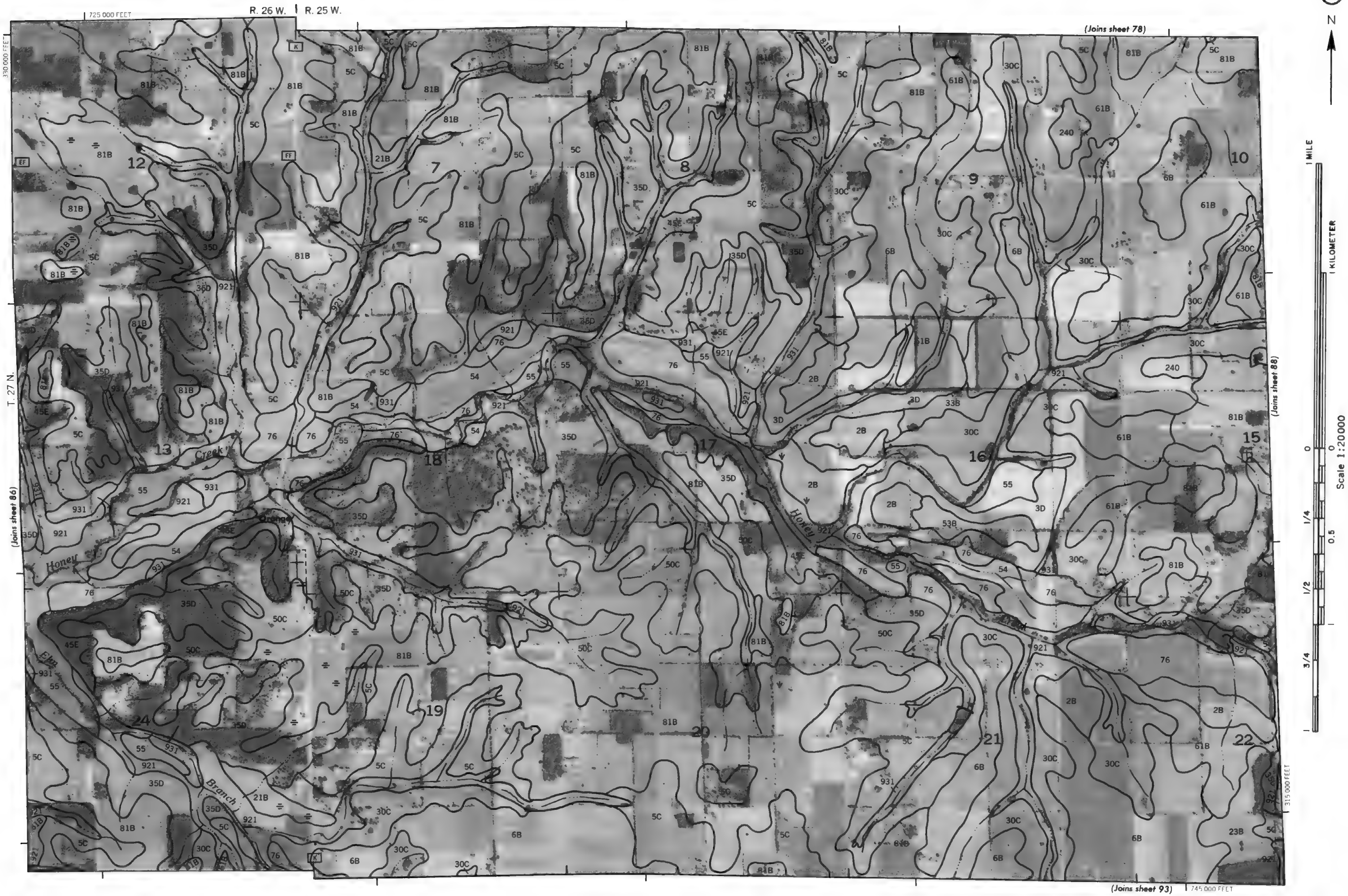
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 85

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 86

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

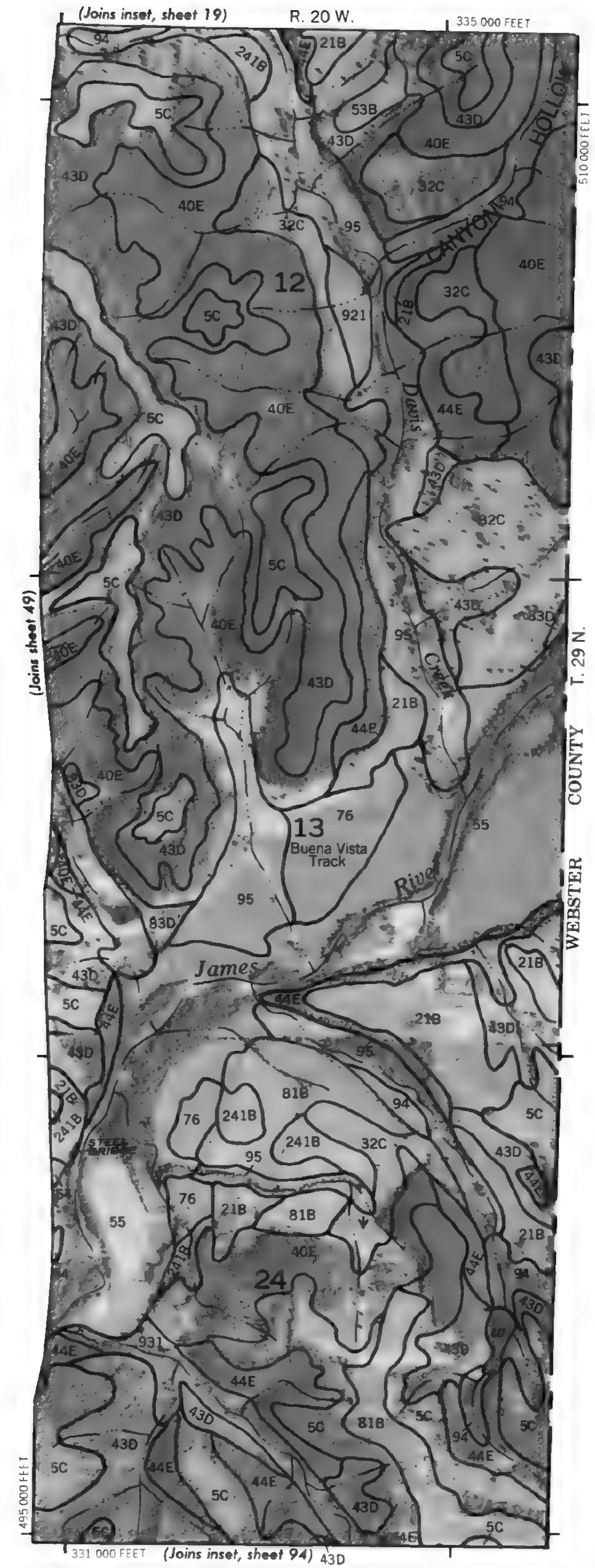
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 86



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 87

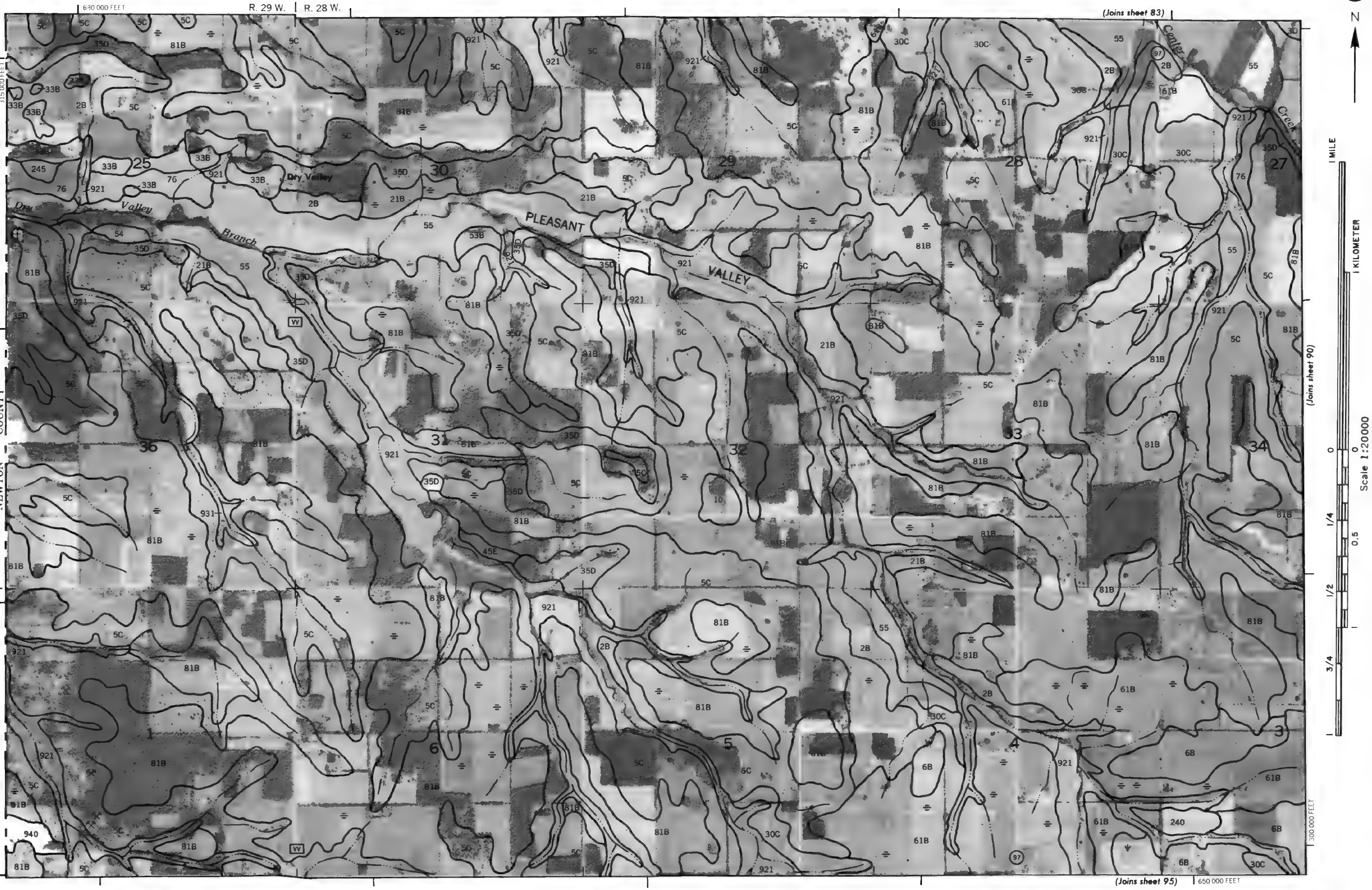
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 88



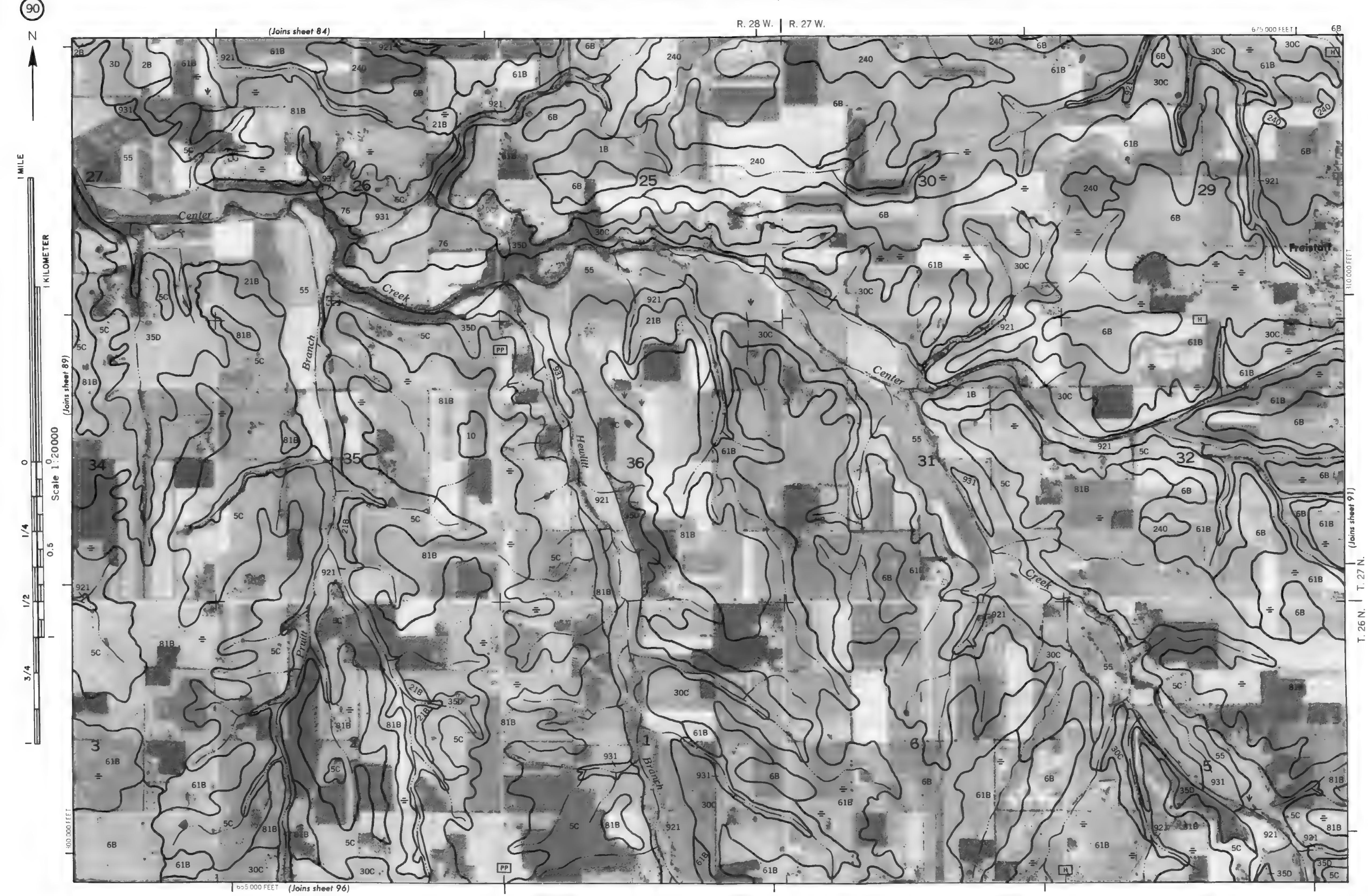
4000 AND 5000 FOOT GRID TICKS

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 89

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



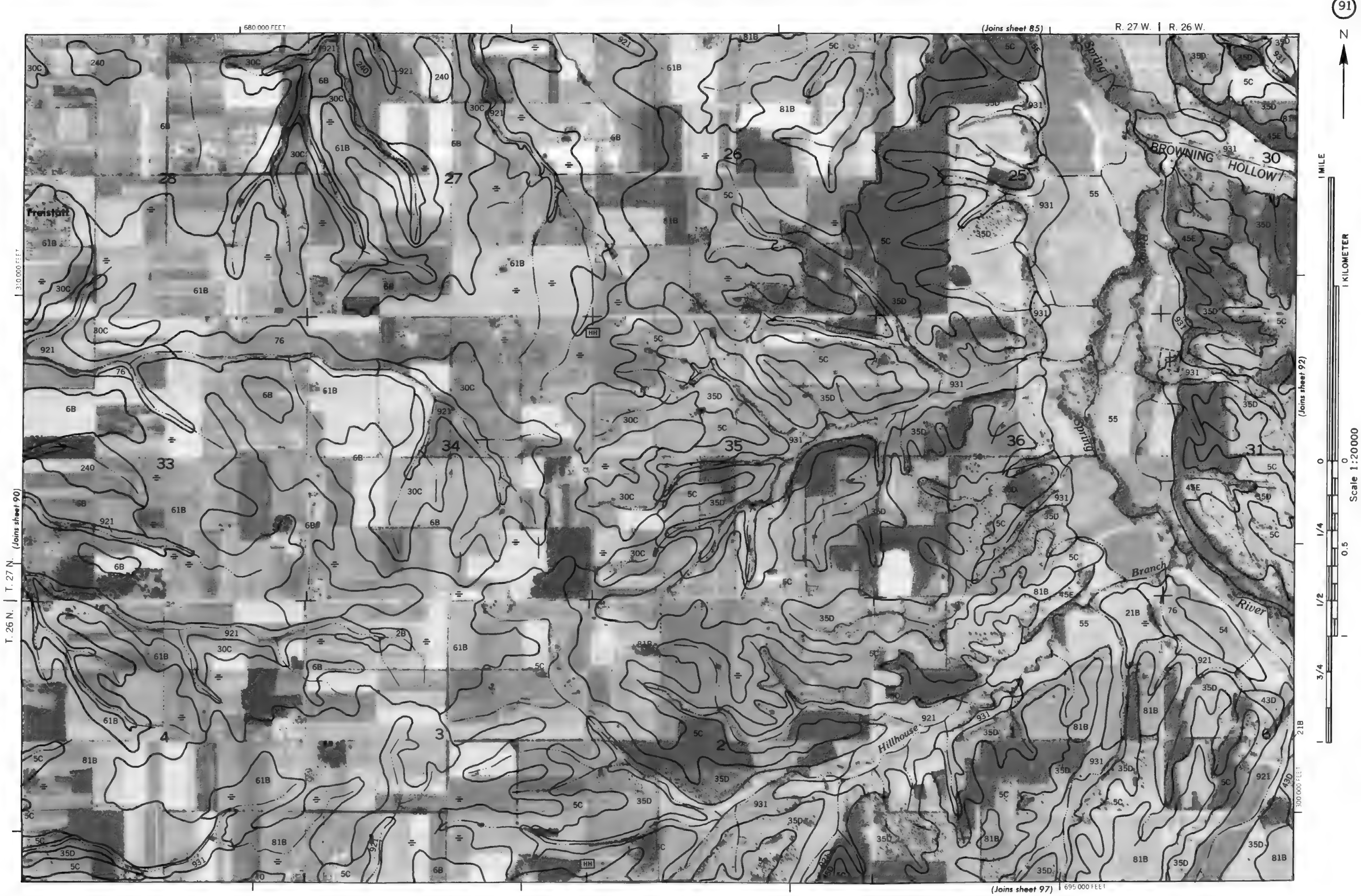
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 90

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 91

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 91

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



92

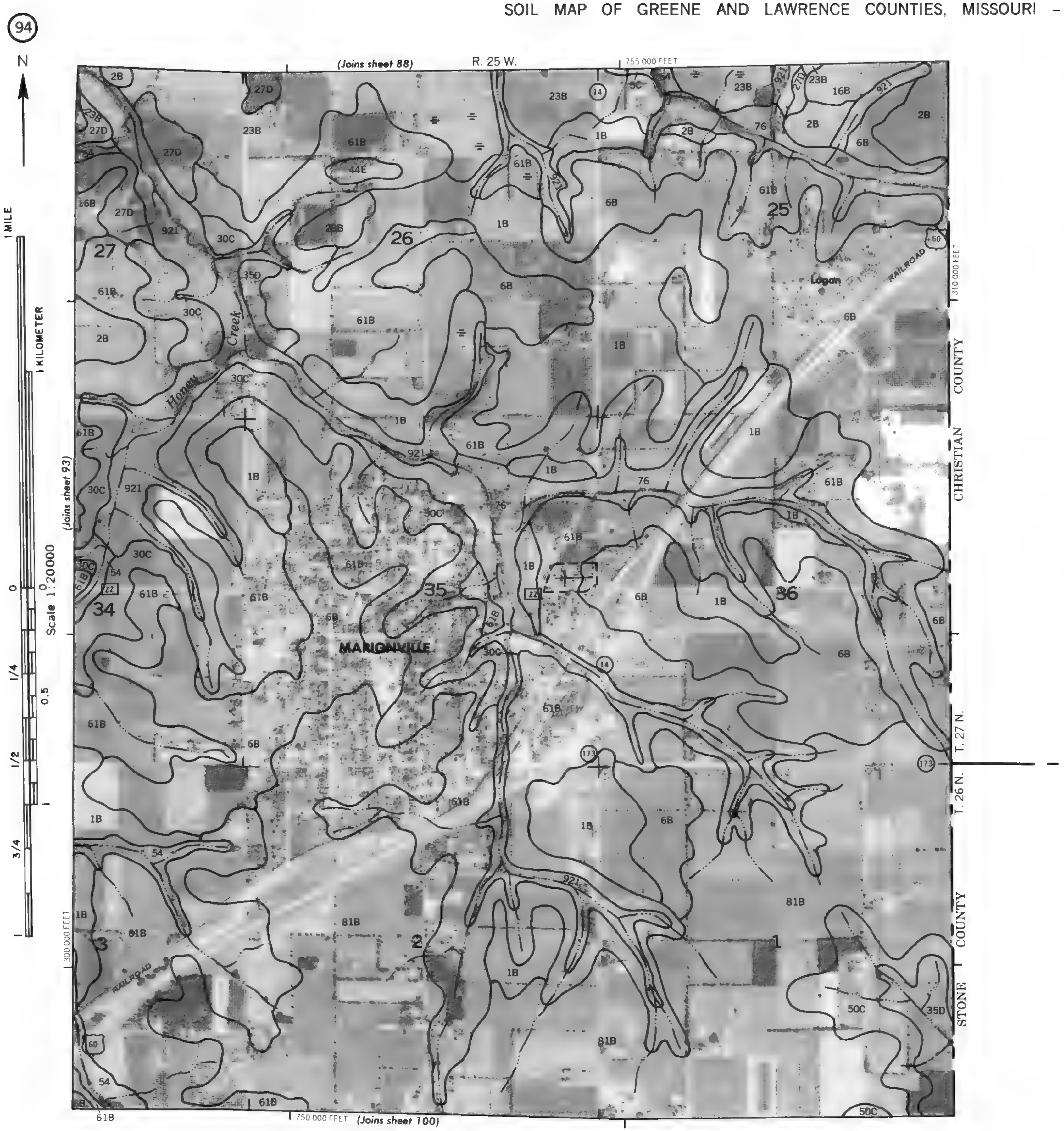
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 92

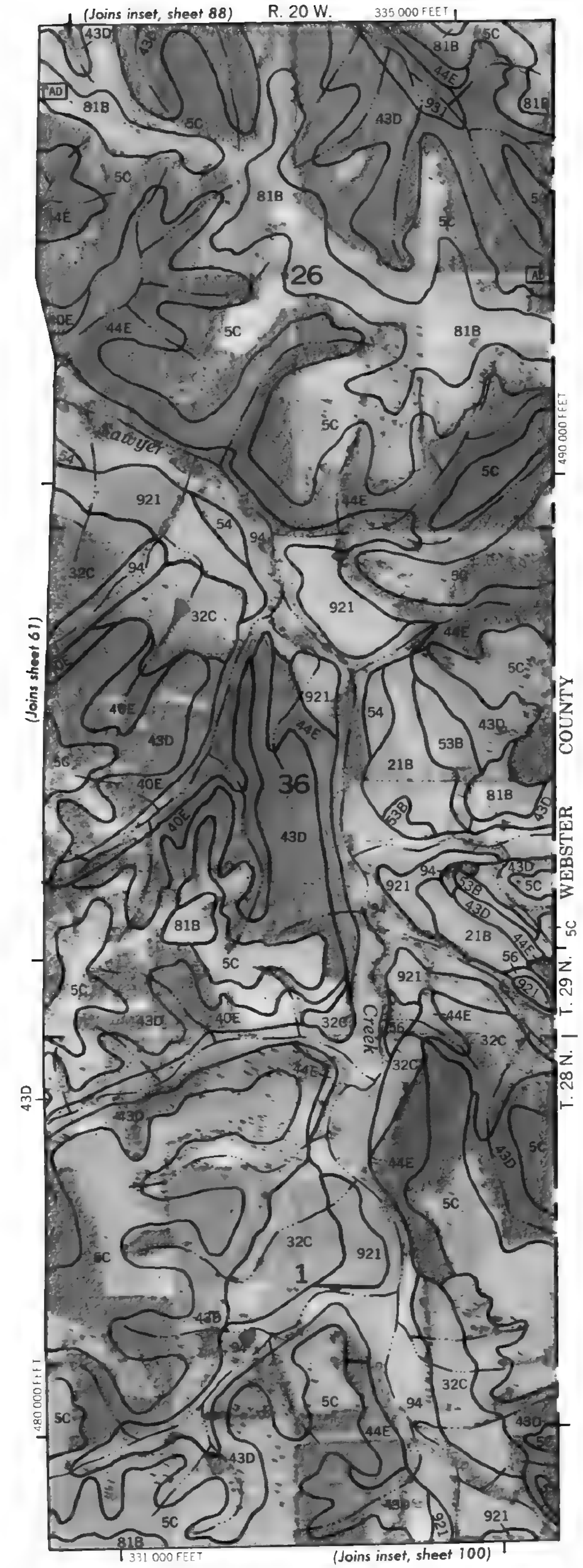
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 92

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 94

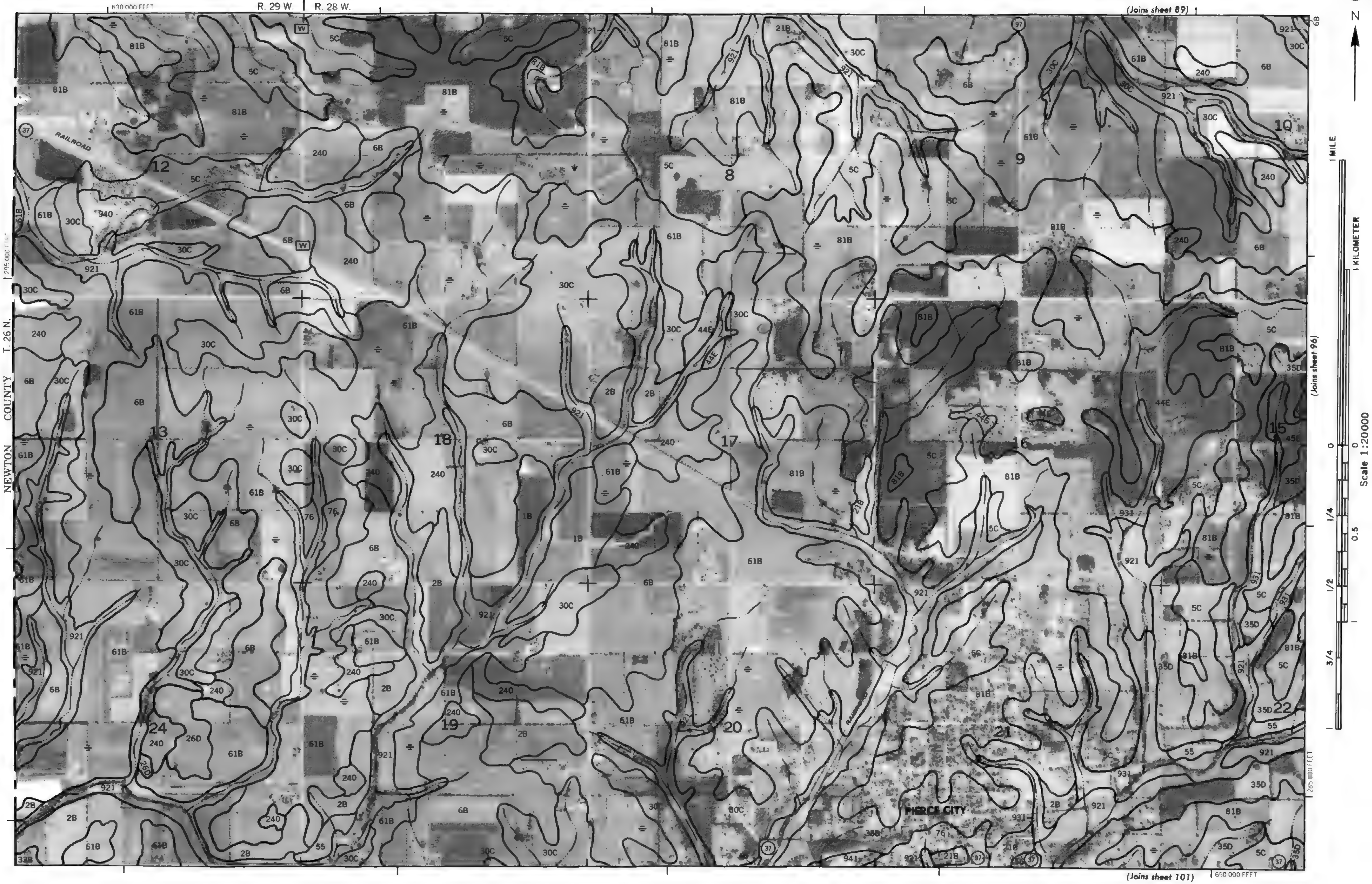




4000 AND 5000 FOOT GRID TICKS

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

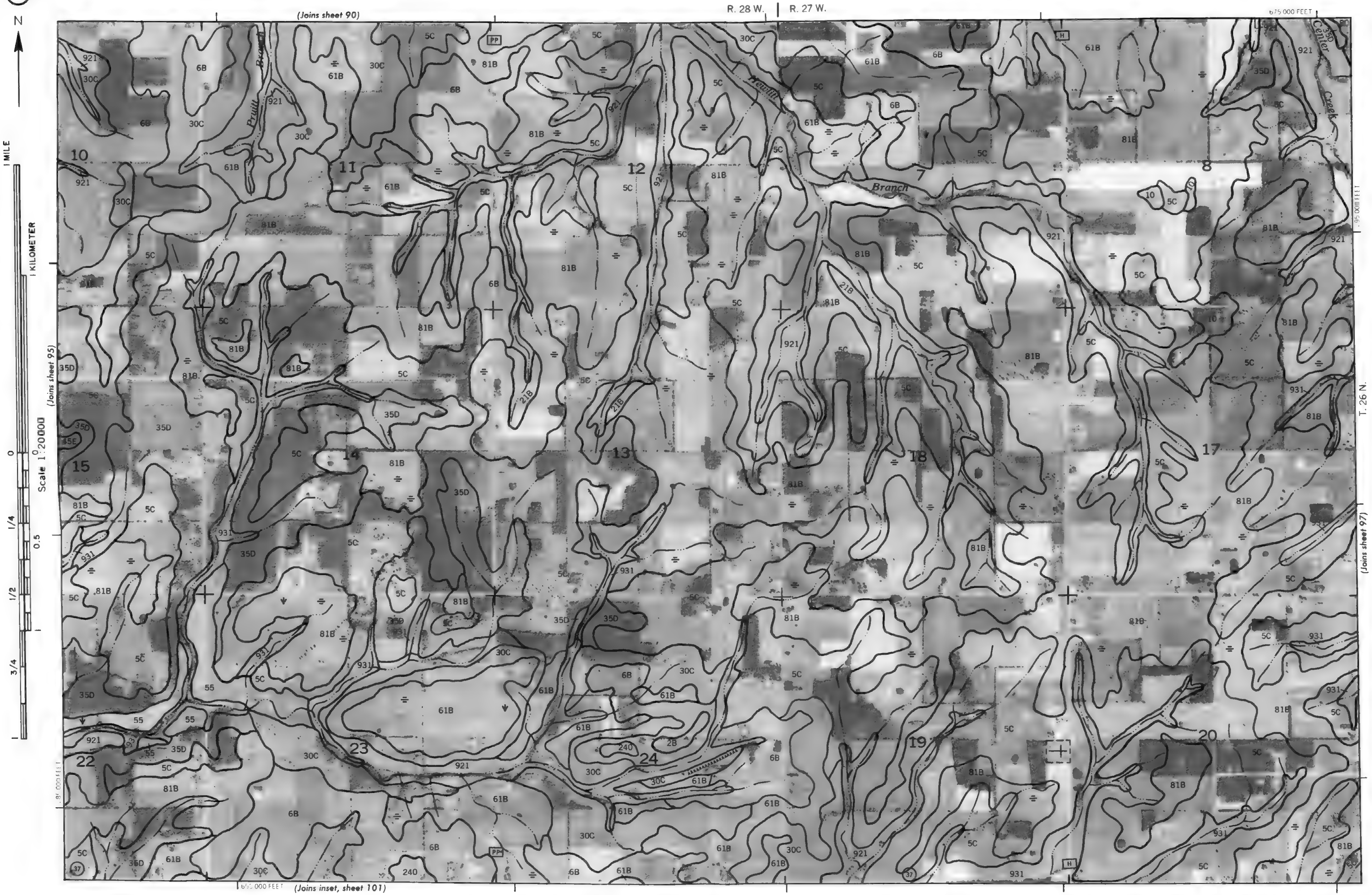
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 94



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 95

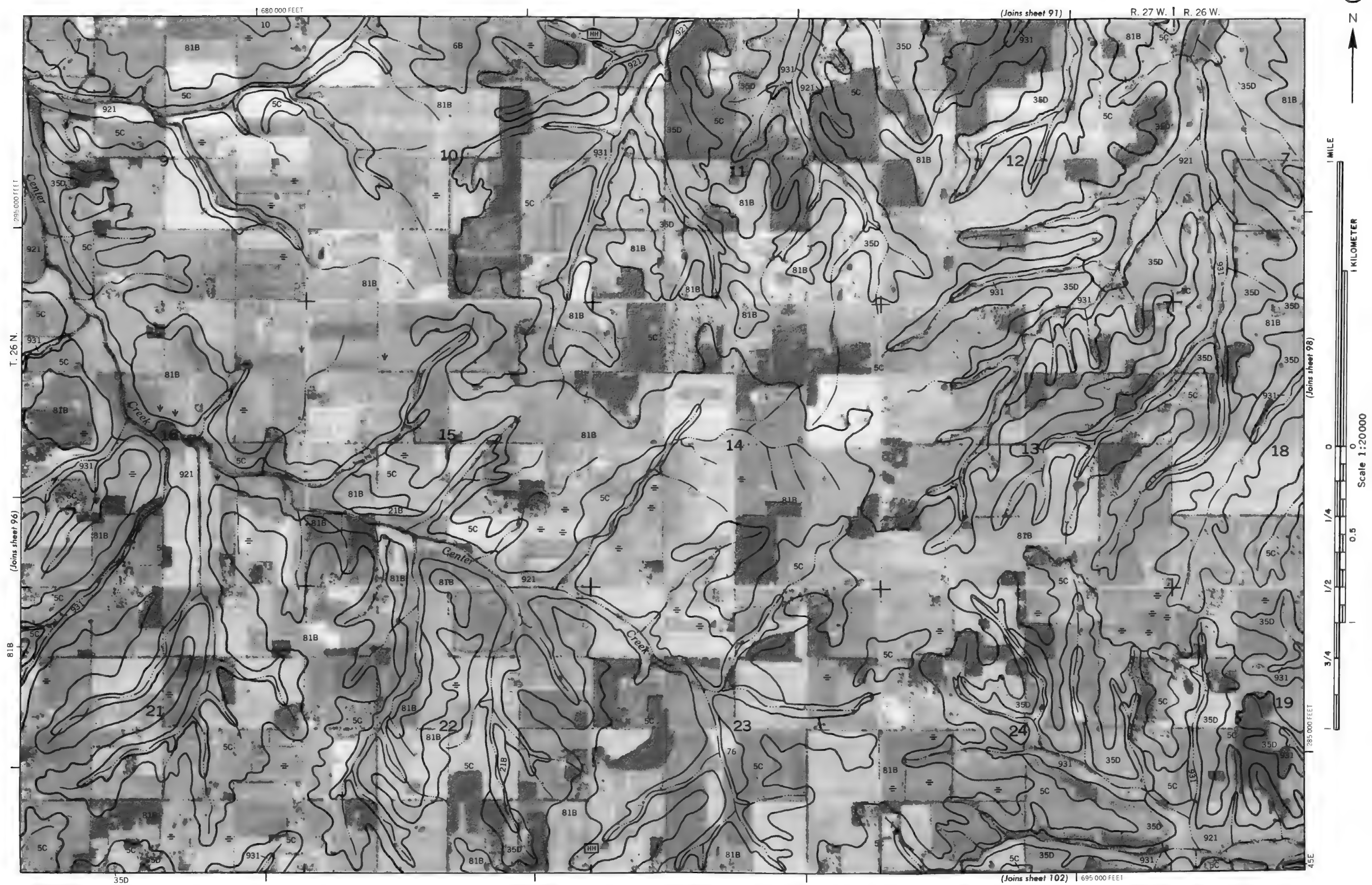
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 96



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

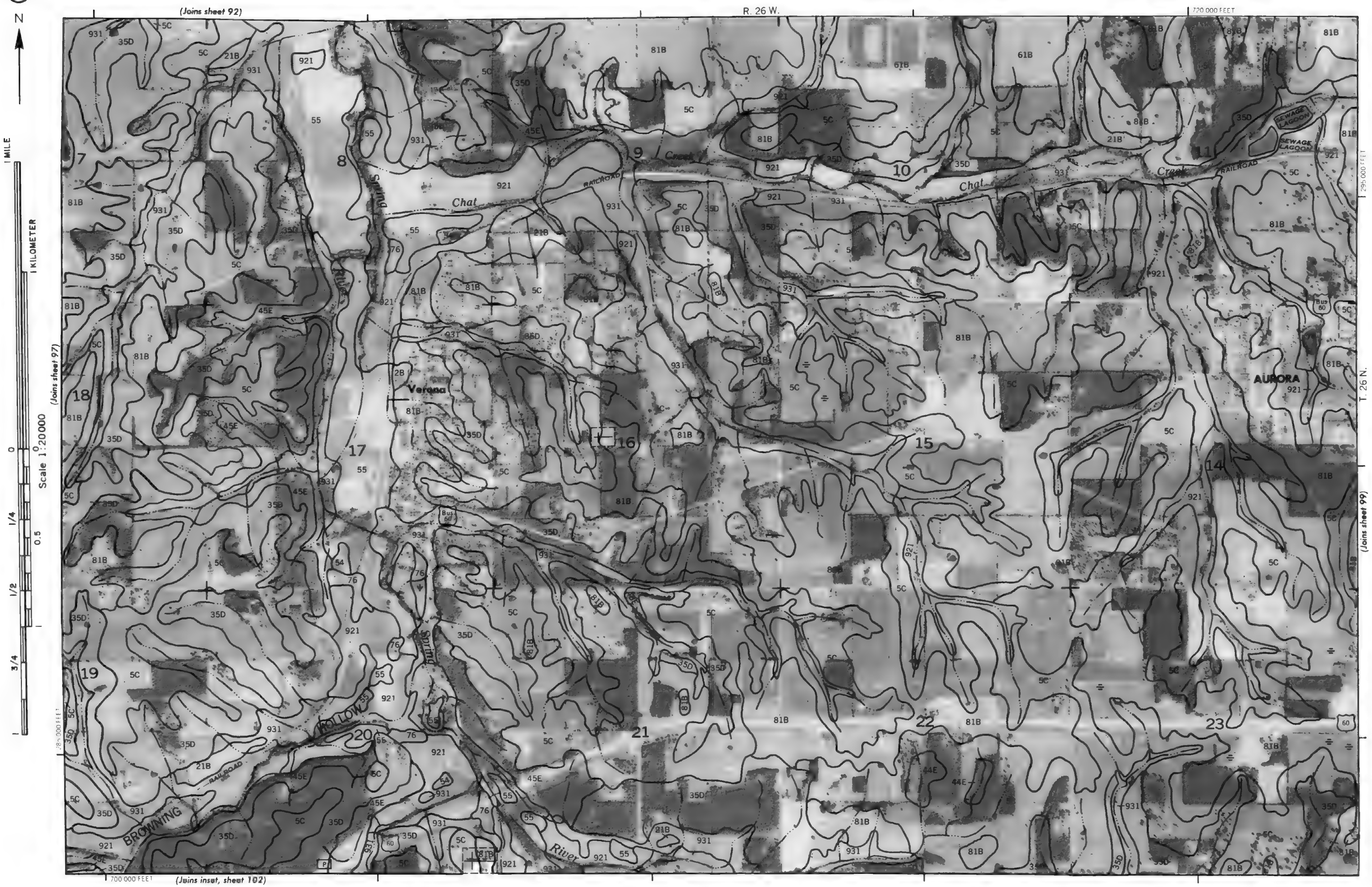
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 97



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 97

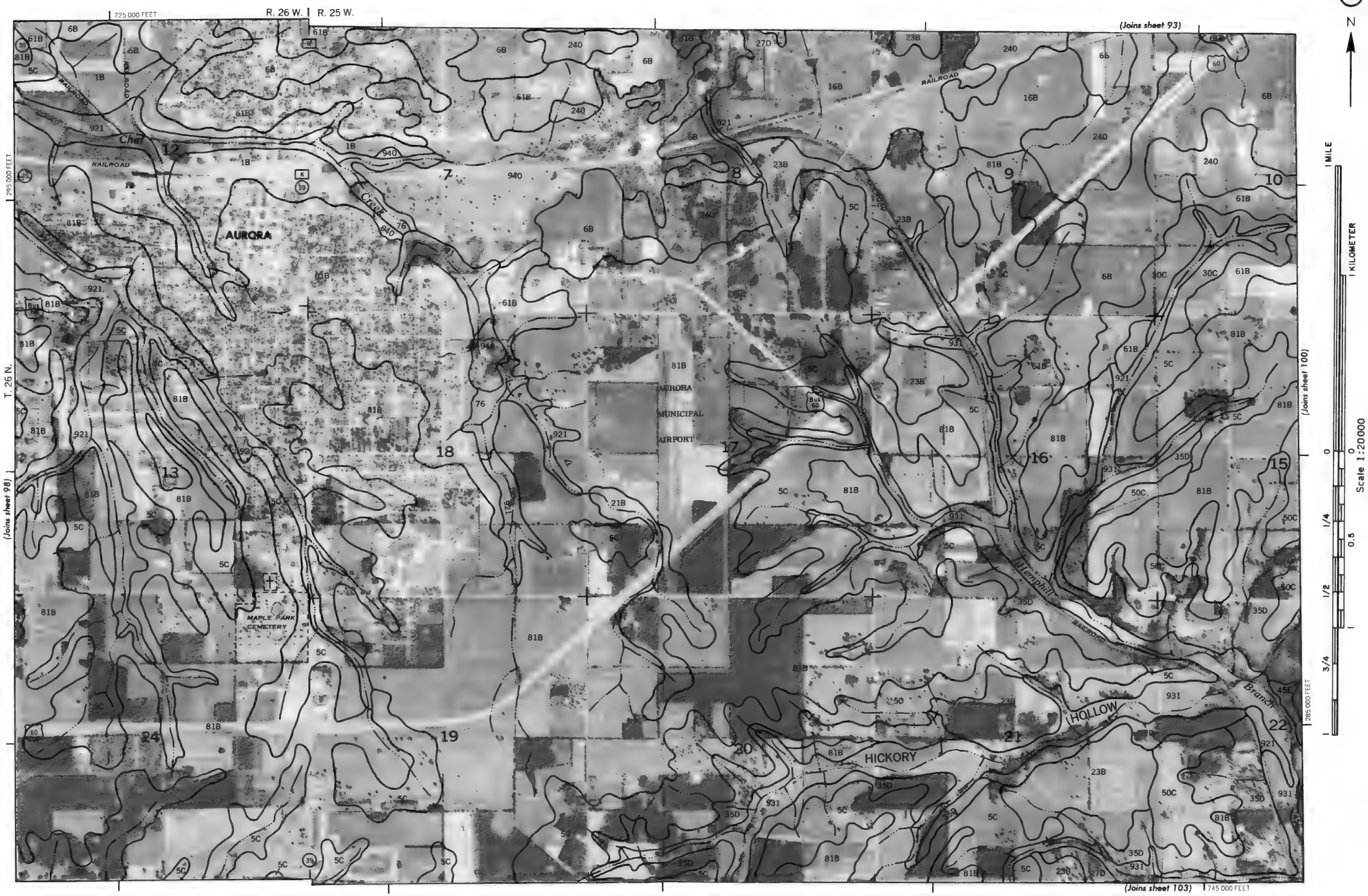
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 98



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

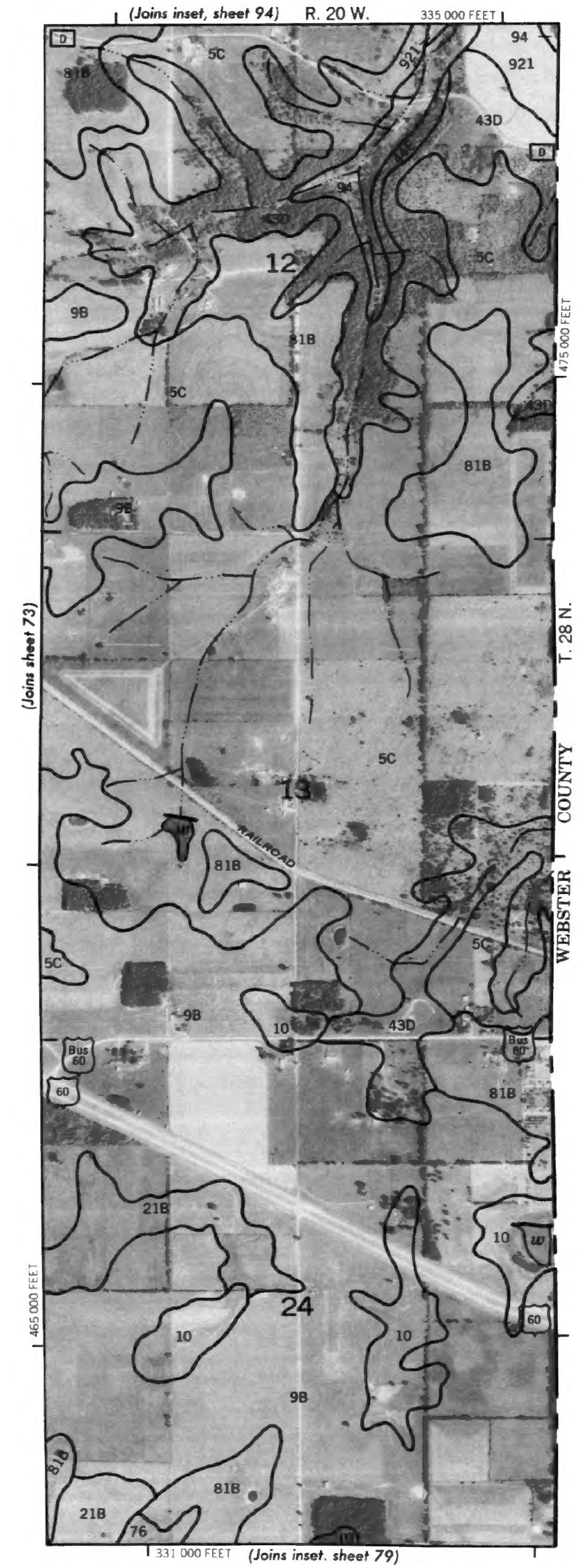
SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 99



GREENE & LAWRENCE COUNTIES, MISSOURI NO. 99

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 100

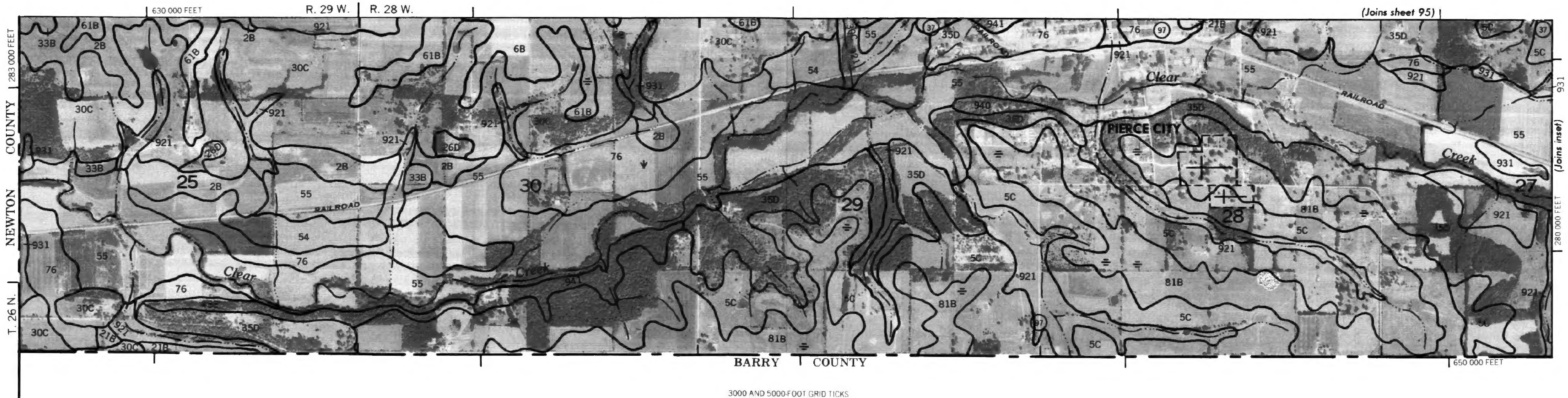


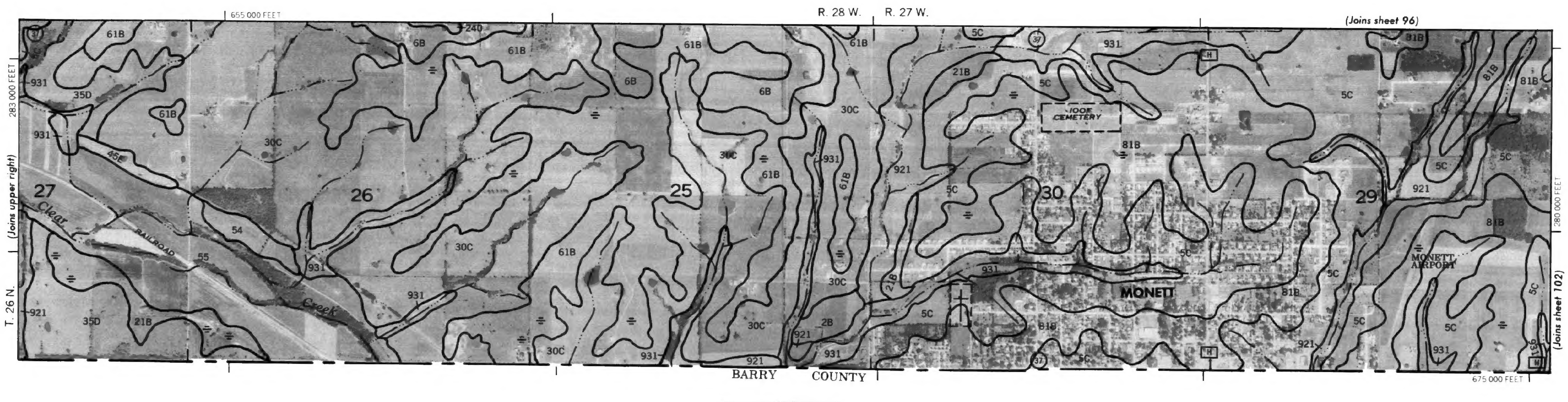
4000 AND 5000-FOOT GRID TICKS

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 100

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI - SHEET NUMBER 101





101

N

1 MILE
1 KILOMETER
0 1/4 1/2 3/4 1
0 0.5 1
Scale 1:20000

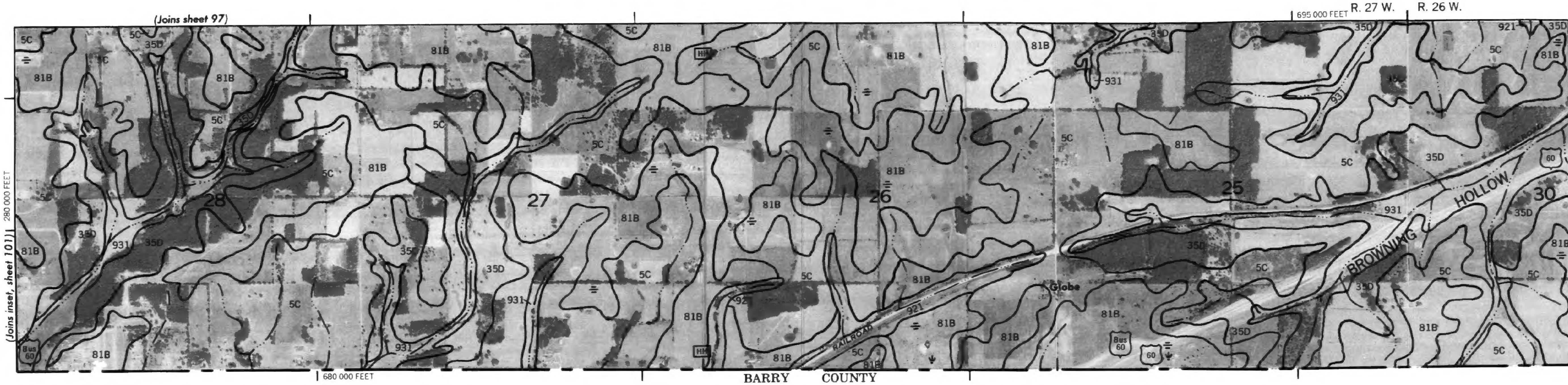
GREENE & LAWRENCE COUNTIES, MISSOURI NO. 101

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF GREENE AND LAWRENCE COUNTIES, MISSOURI – SHEET NUMBER 102

(102)

N



2000 AND 5000-FOOT GRID TICKS

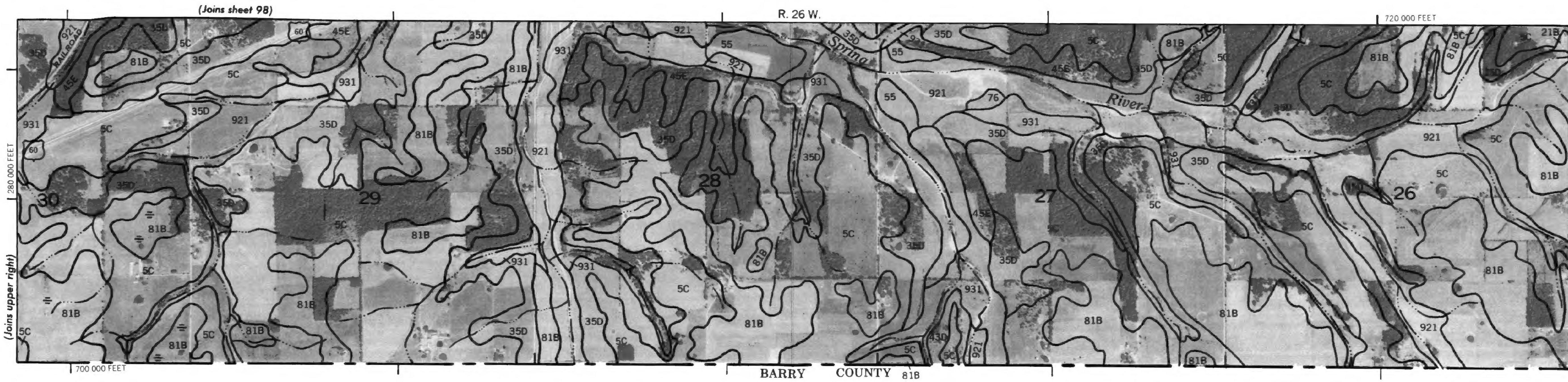
1 MILE

1 KILOMETER

Scale 1:20000

0 1/4 1/2 3/4

0 0.5

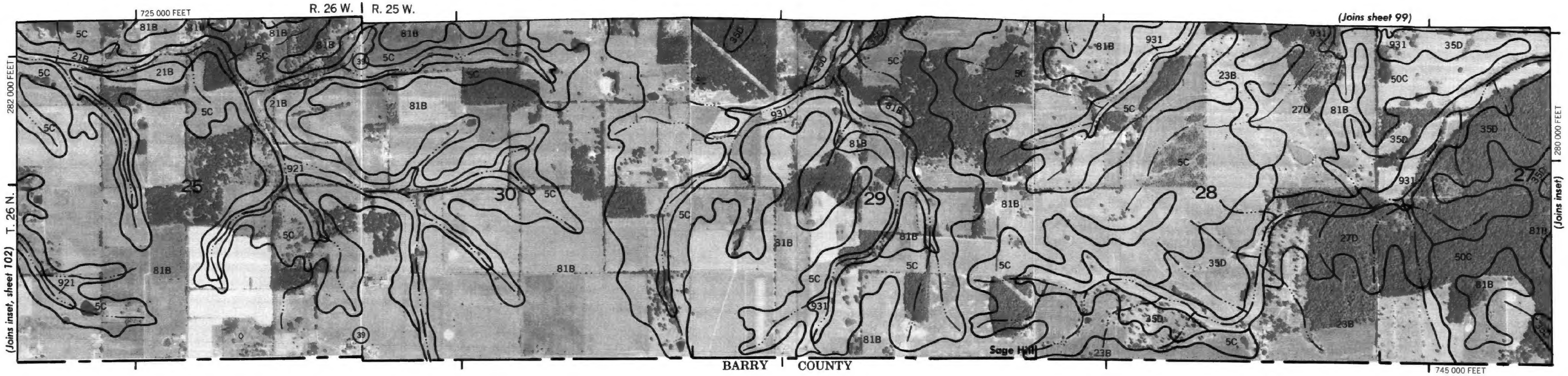


2000 AND 5000-FOOT GRID TICKS

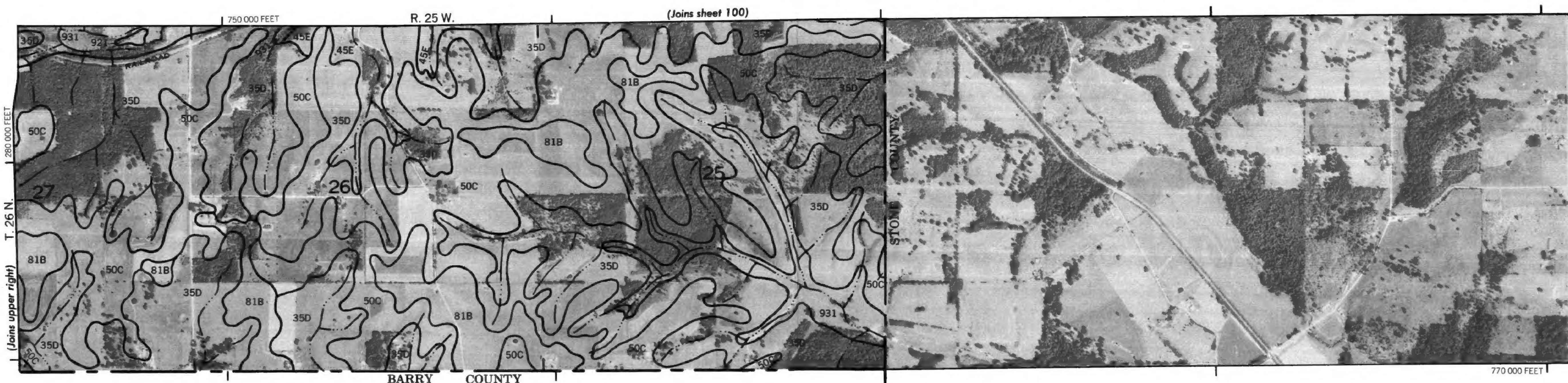
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 102

(103)



2000 AND 5000-FOOT GRID TICKS



3000 AND 5000-FOOT GRID TICKS

N

1 MILE

1 KILOMETER

0 1/4 1/2 3/4

0 0.5

Scale 1:20000

GREENE & LAWRENCE COUNTIES, MISSOURI NO. 103

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.